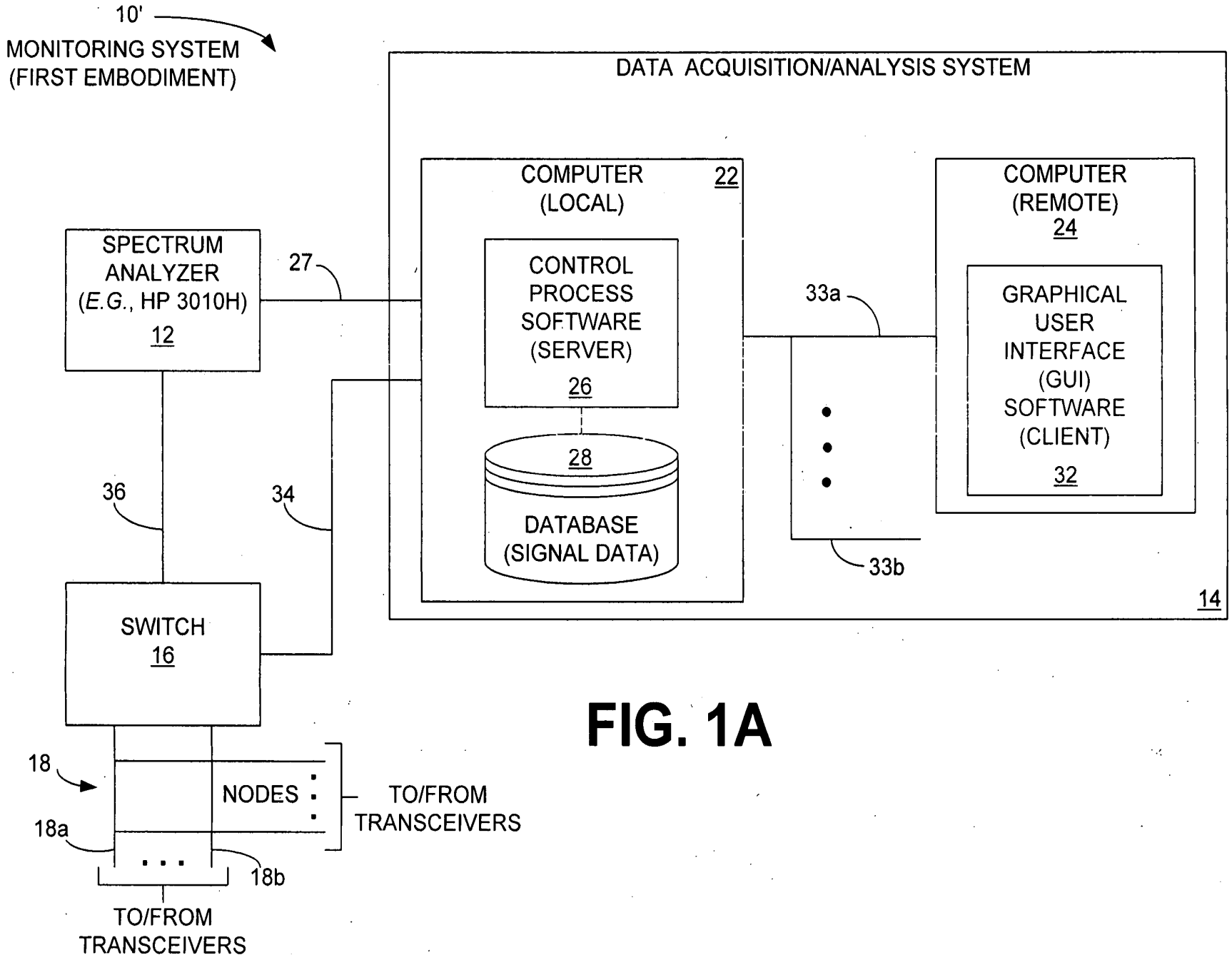

10'
MONITORING SYSTEM
(FIRST EMBODIMENT)
DATA ACQUISITION/ANALYSIS SYSTEM
COMPUTER
(LOCAL)
22
CONTROL
PROCESS
SOFTWARE
(SERVER)
26
28
DATABASE
(SIGNAL DATA)
COMPUTER
(REMOTE)
24
GRAPHICAL
USER
INTERFACE
(GUI)
SOFTWARE
(CLIENT)
32
SPECTRUM
ANALYZER
(E.G., HP 3010H)
12
27
33a
33b
36
34
SWITCH
16
14
18
18a
18b
NODES
TO/FROM
TRANSCEIVERS
TO/FROM
TRANSCEIVERS

FIG. 1A

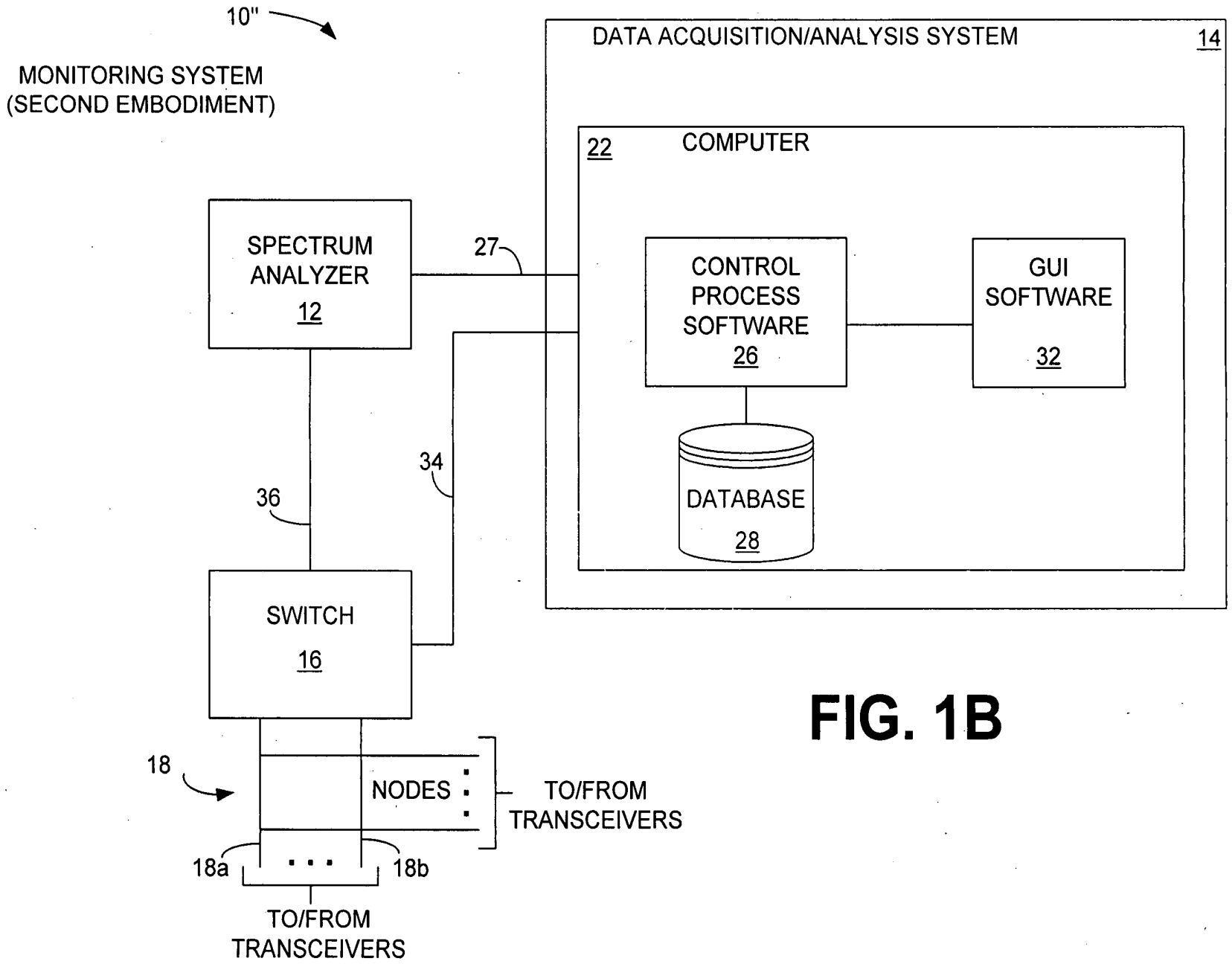
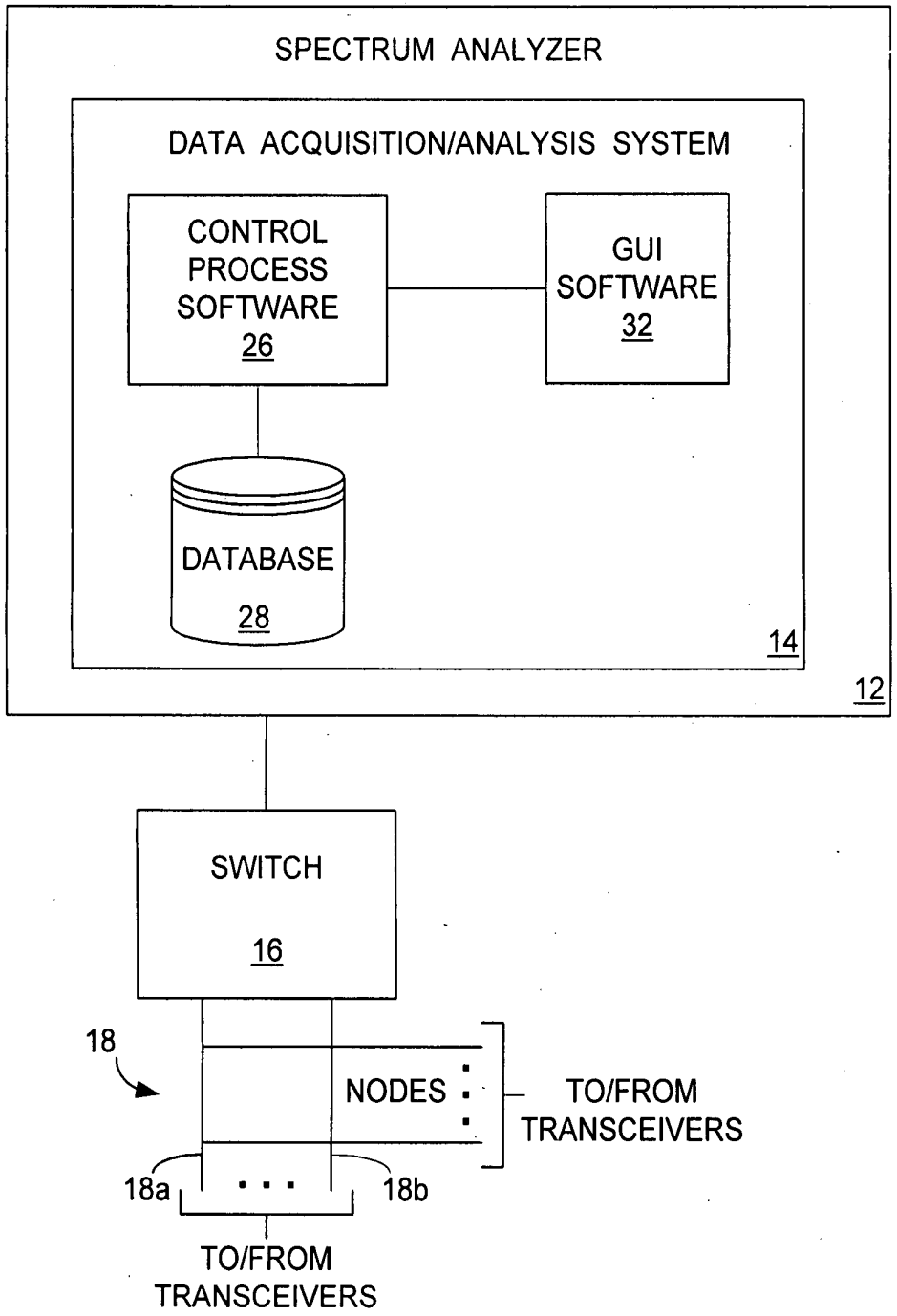

10"
MONITORING SYSTEM
(SECOND EMBODIMENT)
DATA ACQUISITION/ANALYSIS SYSTEM
14
22
COMPUTER
SPECTRUM ANALYZER
12
27
CONTROL PROCESS SOFTWARE
26
GUI SOFTWARE
32
DATABASE
28
34
36
SWITCH
16
18
NODES
TO/FROM TRANSCEIVERS
18a
18b
TO/FROM TRANSCEIVERS

FIG. 1B



10'''

MONITORING SYSTEM
(THIRD EMBODIMENT)

FIG. 1C

DATA STRUCTURE OF DATABASE

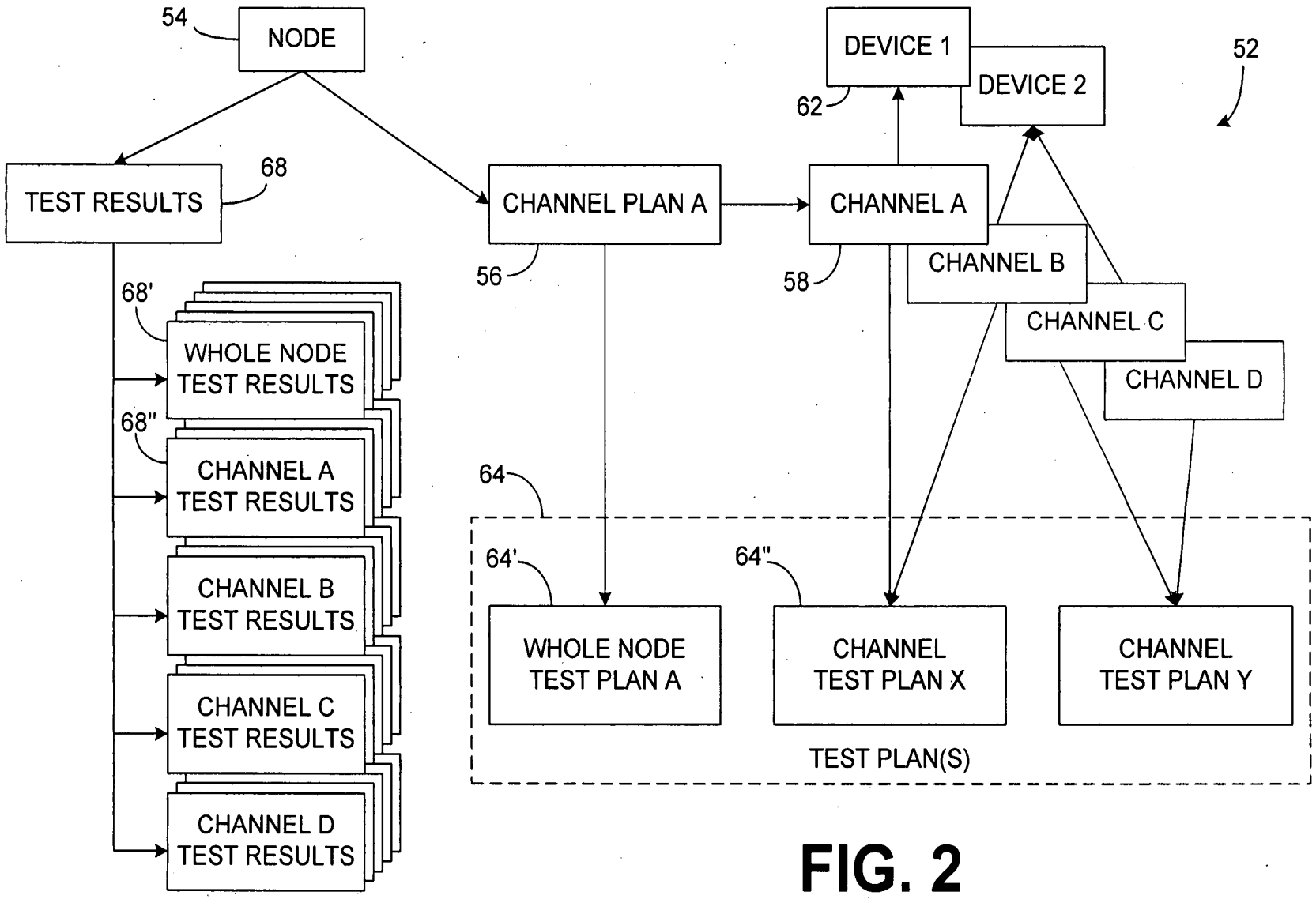


FIG. 2

Docket Number

CHANNEL PLAN

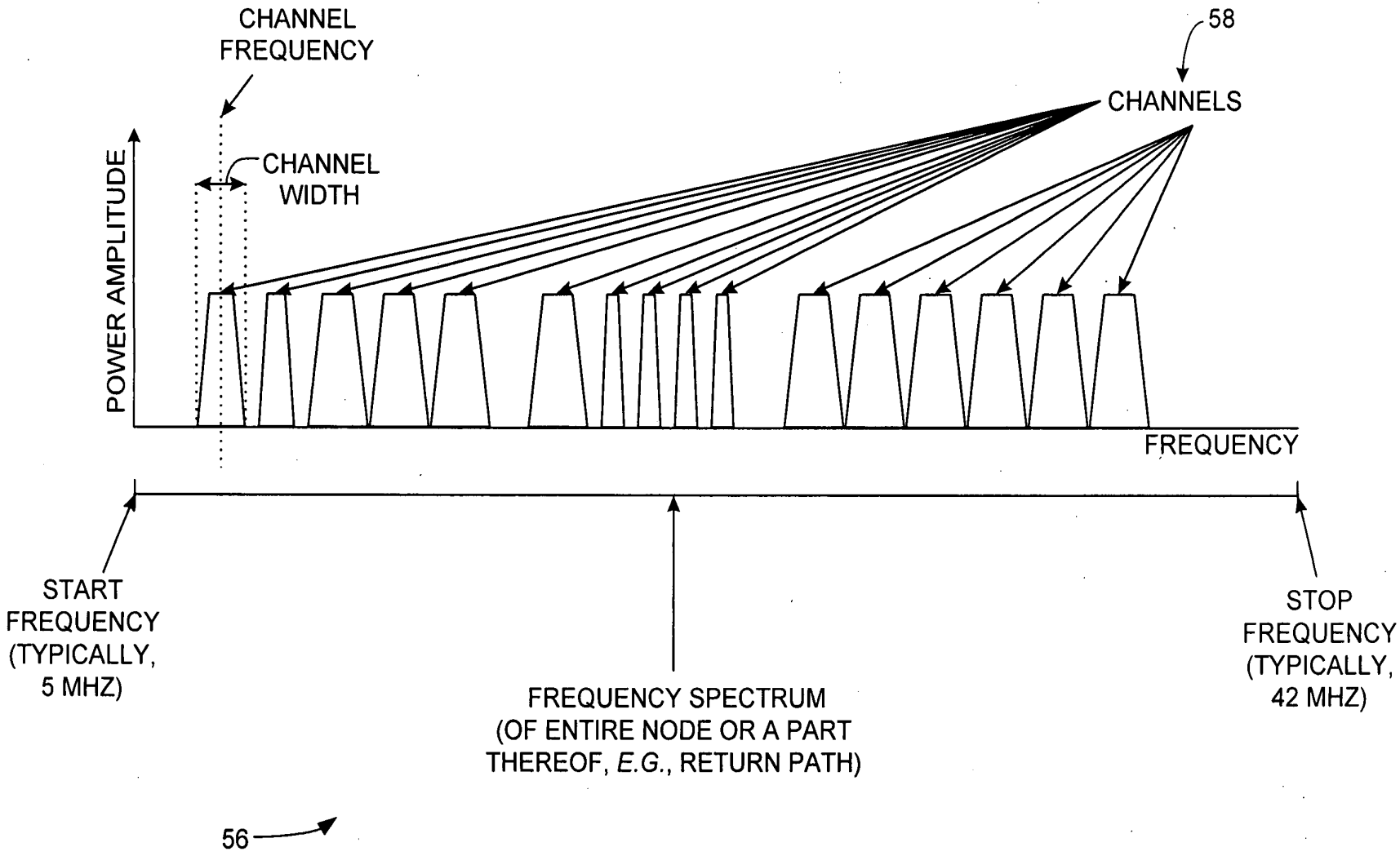


FIG. 3A

CHANNEL DEVICE

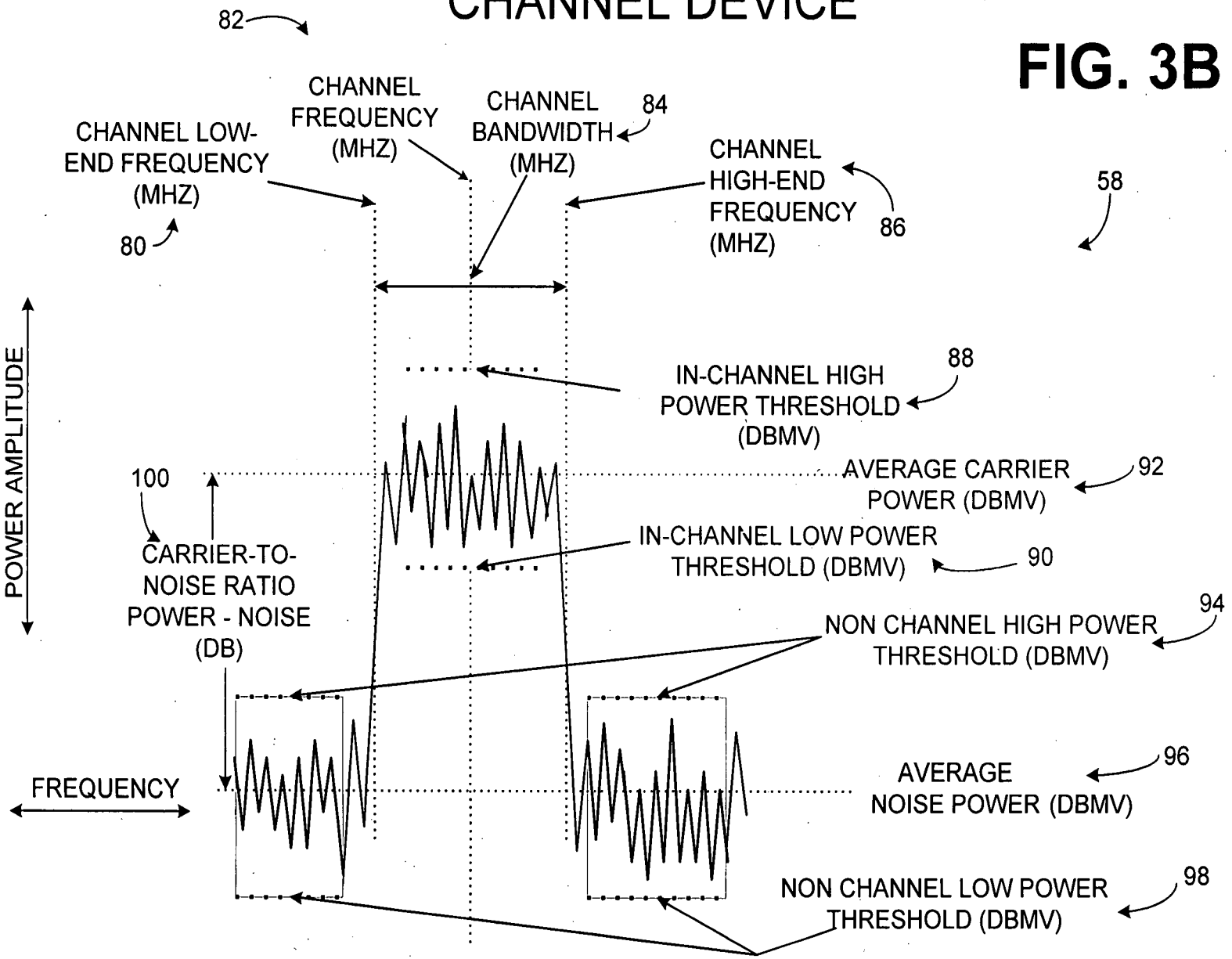


FIG. 3B

BOEING Classified

TEST PLAN

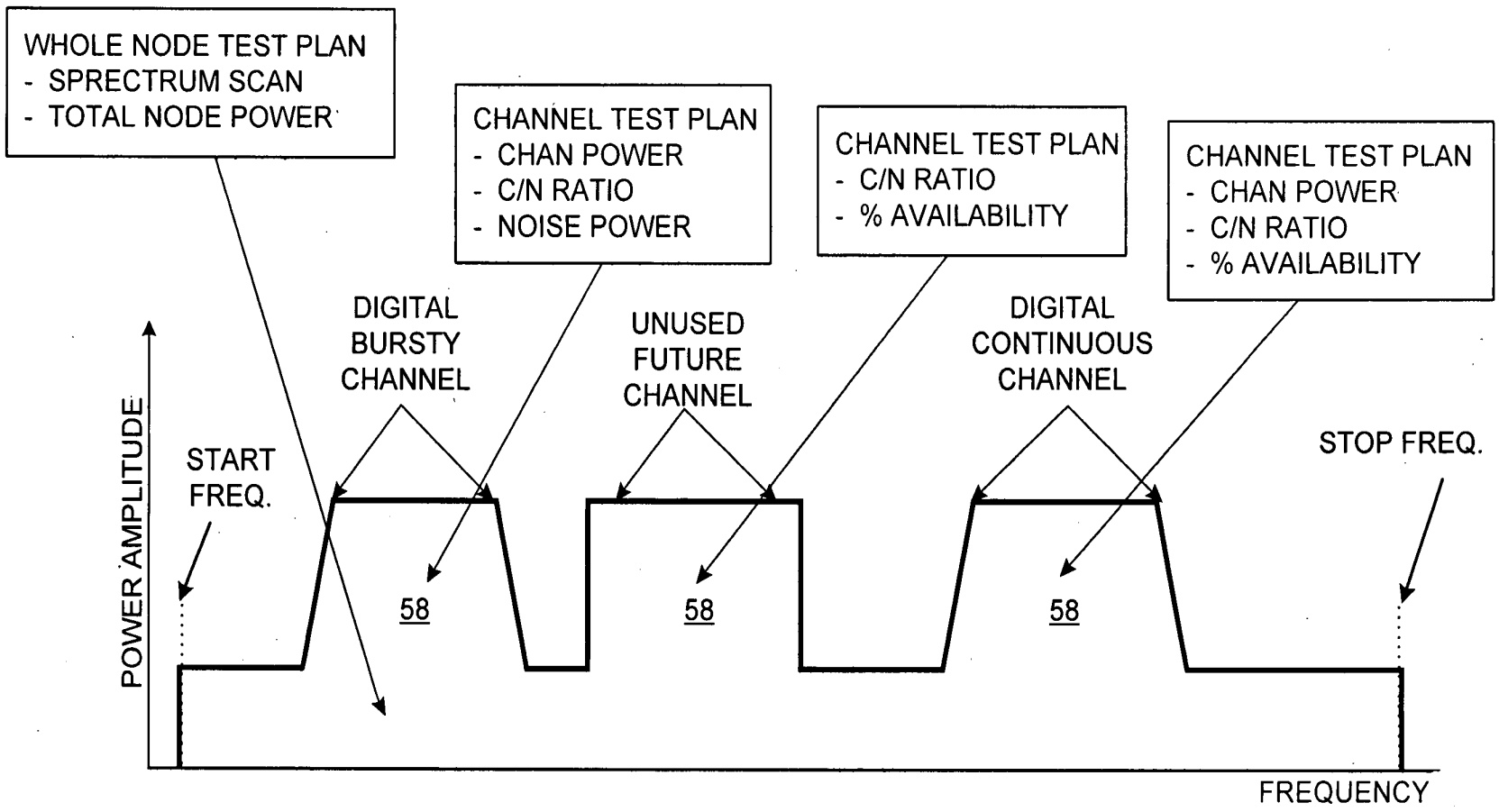


FIG. 3C

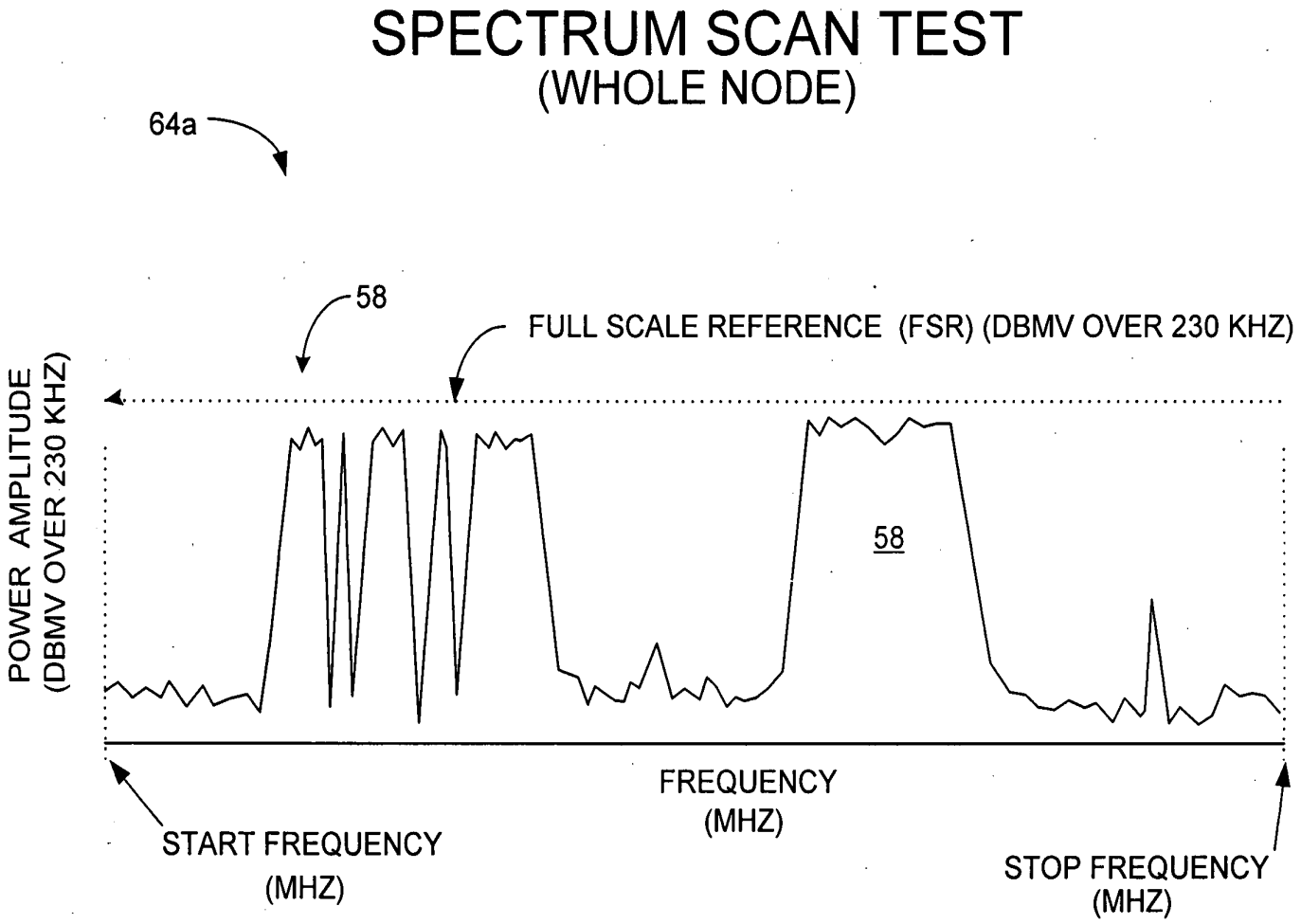

SPECTRUM SCAN TEST
(WHOLE NODE)
64a
58
FULL SCALE REFERENCE (FSR) (DBMV OVER 230 KHZ)
POWER AMPLITUDE
(DBMV OVER 230 KHZ)
58
FREQUENCY
(MHZ)
START FREQUENCY
(MHZ)
STOP FREQUENCY
(MHZ)

FIG. 3D

SPECTRUM SCAN TEST
(ALARM LIMITS)

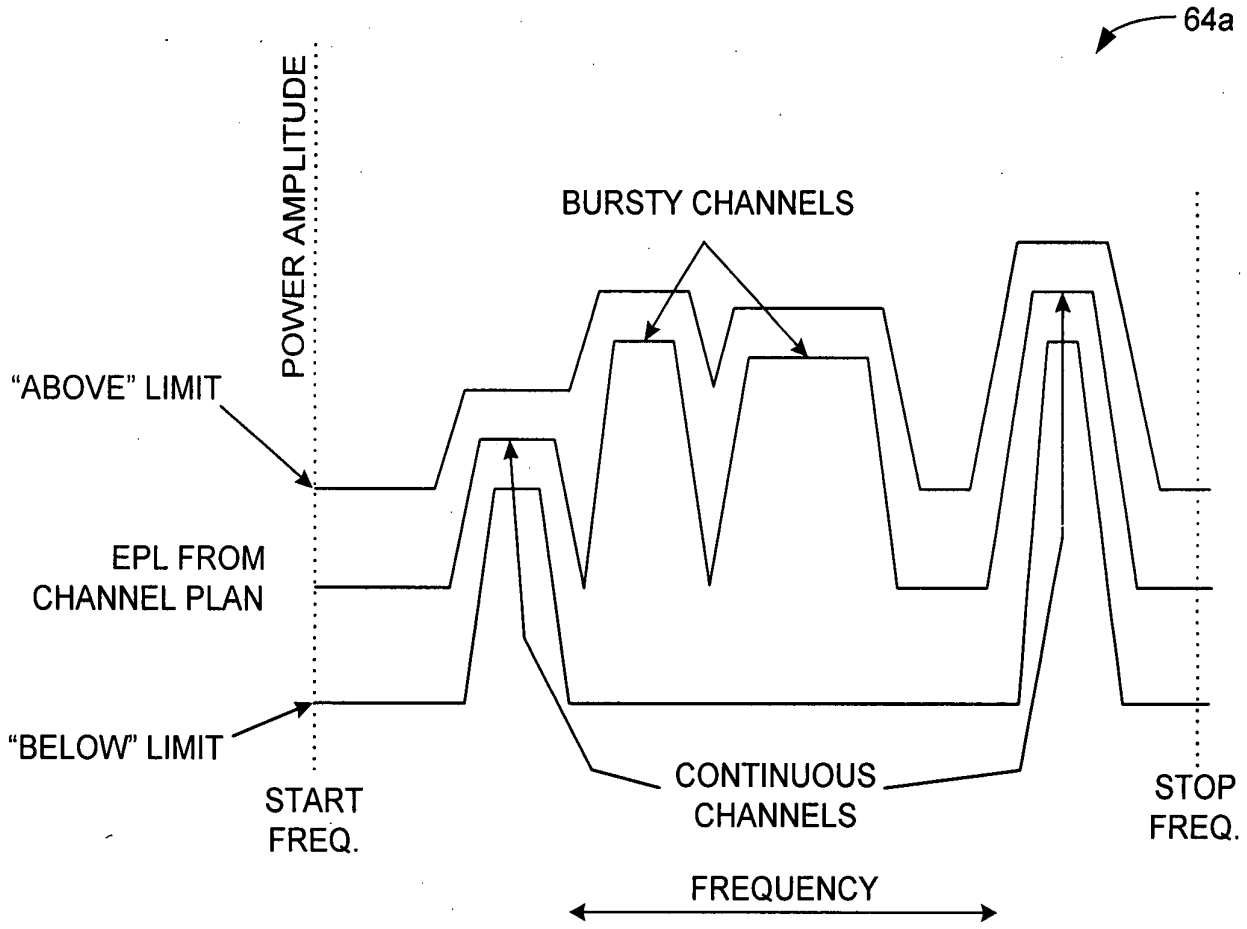


FIG. 3E

6605117 - 2006-10-03

TOTAL NODE POWER TEST
(WHOLE NODE)

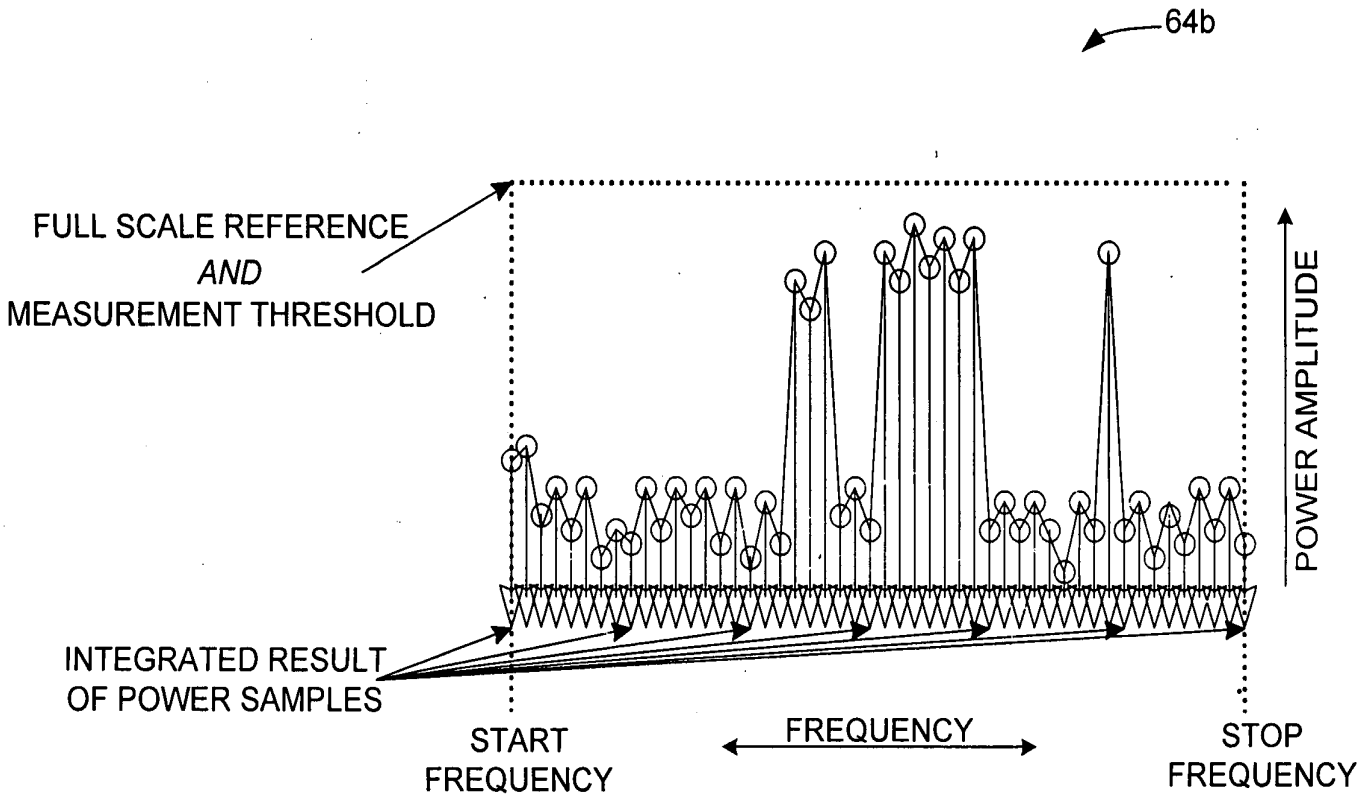


FIG. 3F

Docket Shelved

AVERAGE NOISE POWER TEST (CHANNEL)

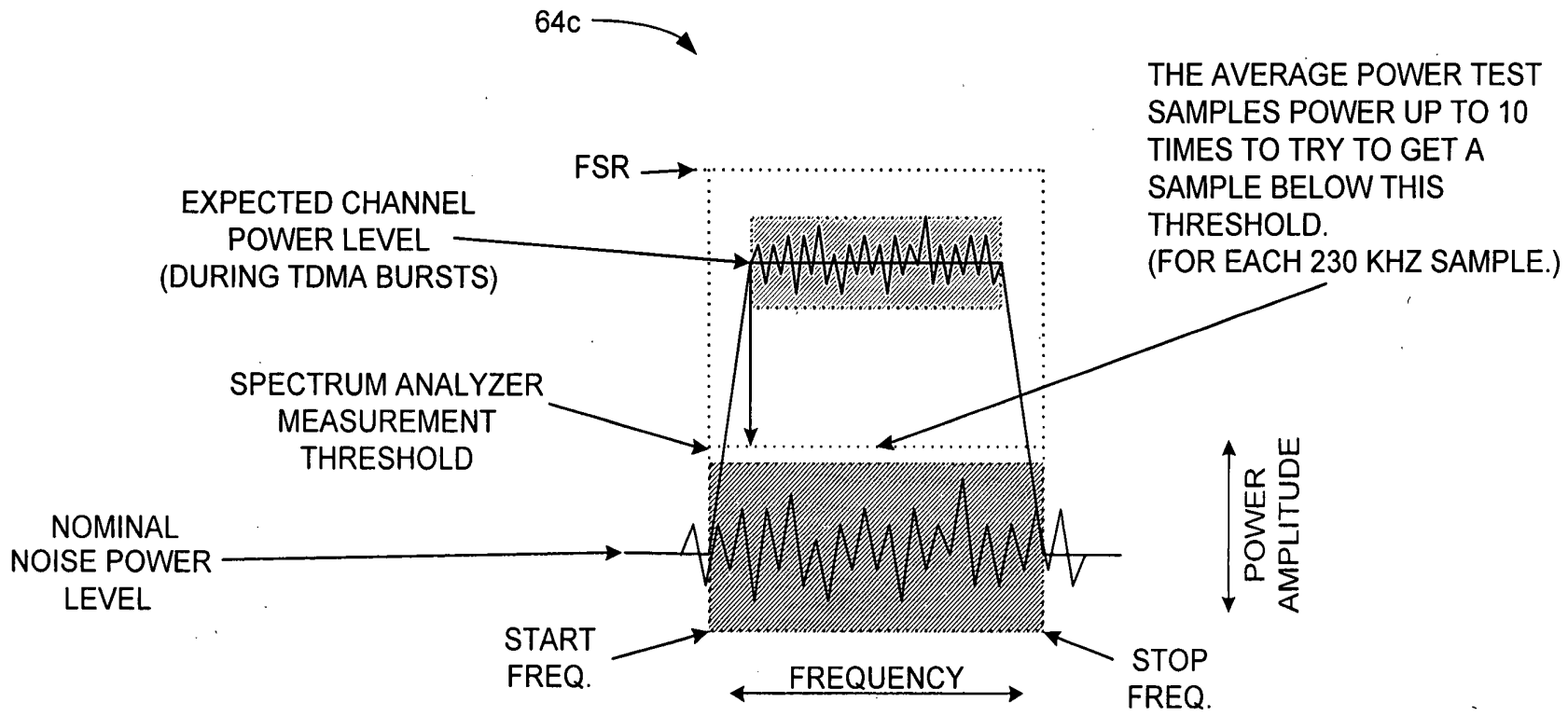


FIG. 3G

AVERAGE NOISE POWER TEST (ALARM LIMITS)

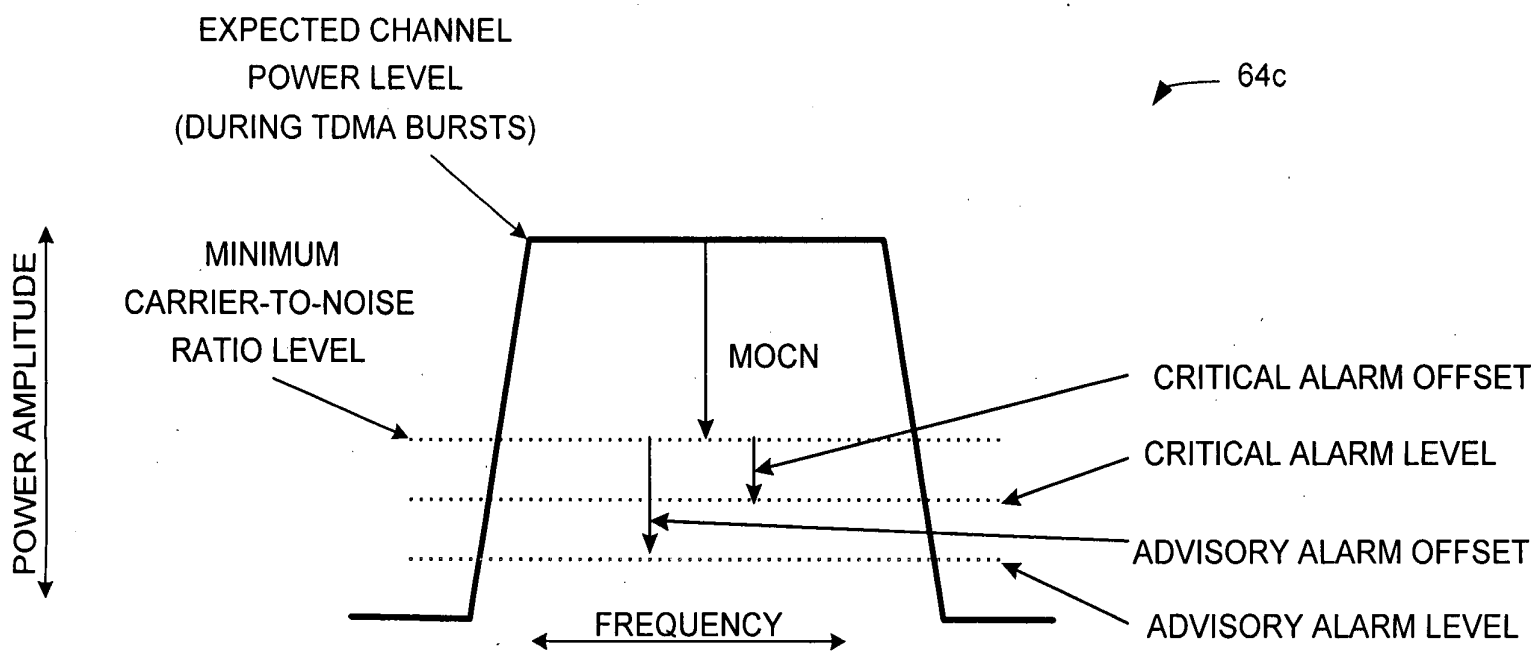


FIG. 3H

BEST AVAILABLE COPY

CHANNEL POWER TEST (CHANNEL)

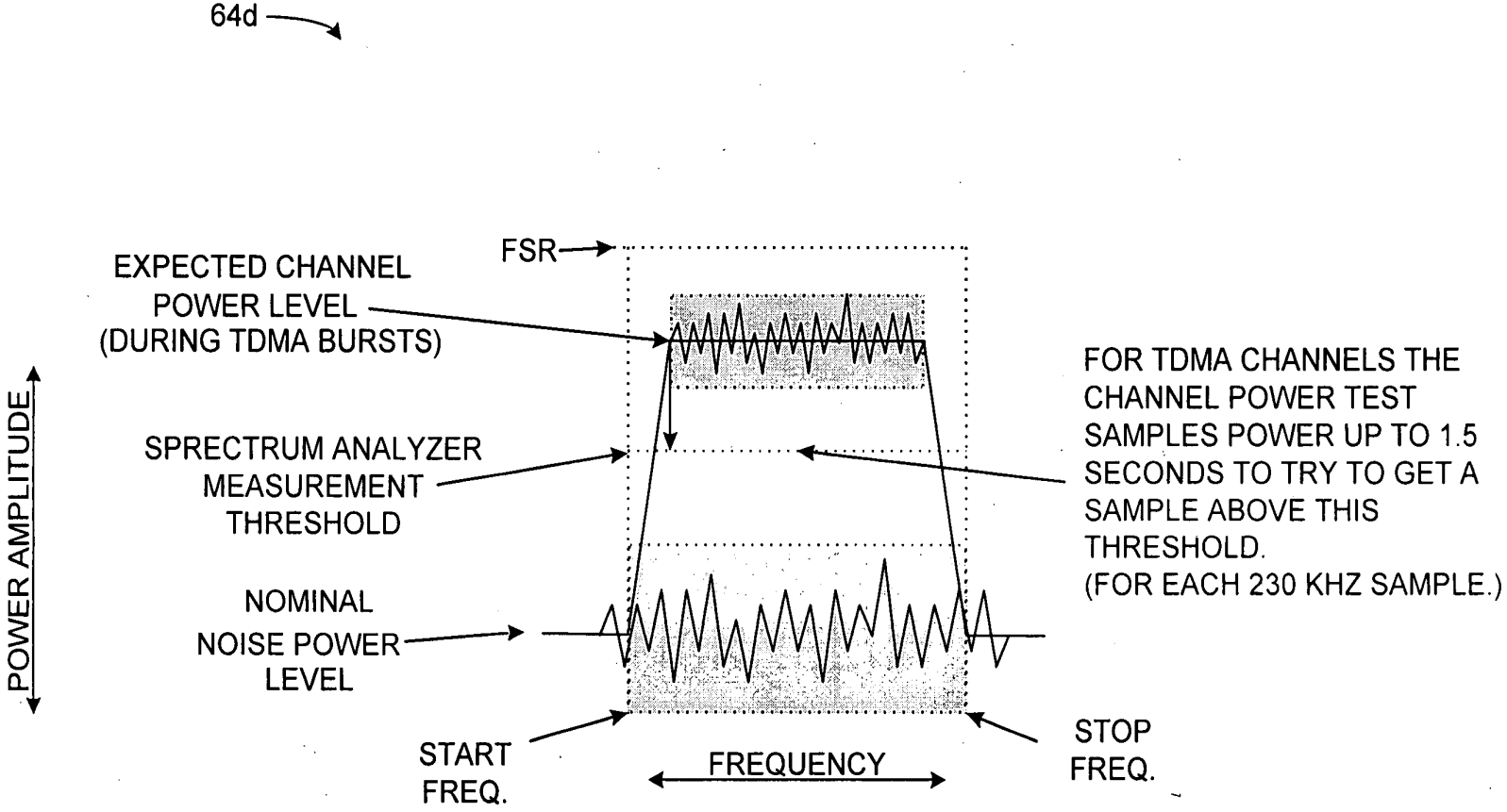


FIG. 3I

BOEING

CHANNEL POWER TEST (ALARM LIMITS)

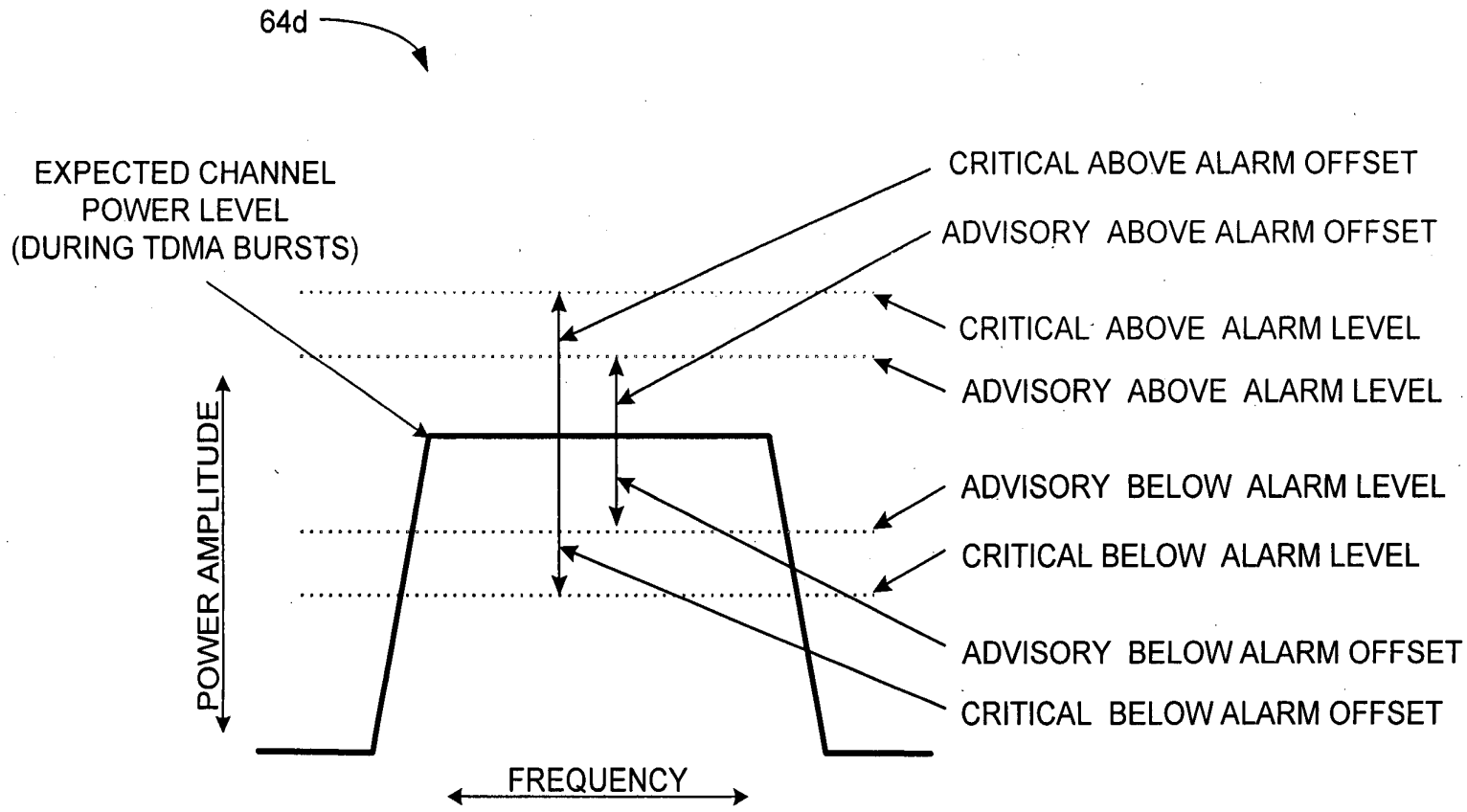


FIG. 3J

EBOFT: 2192000

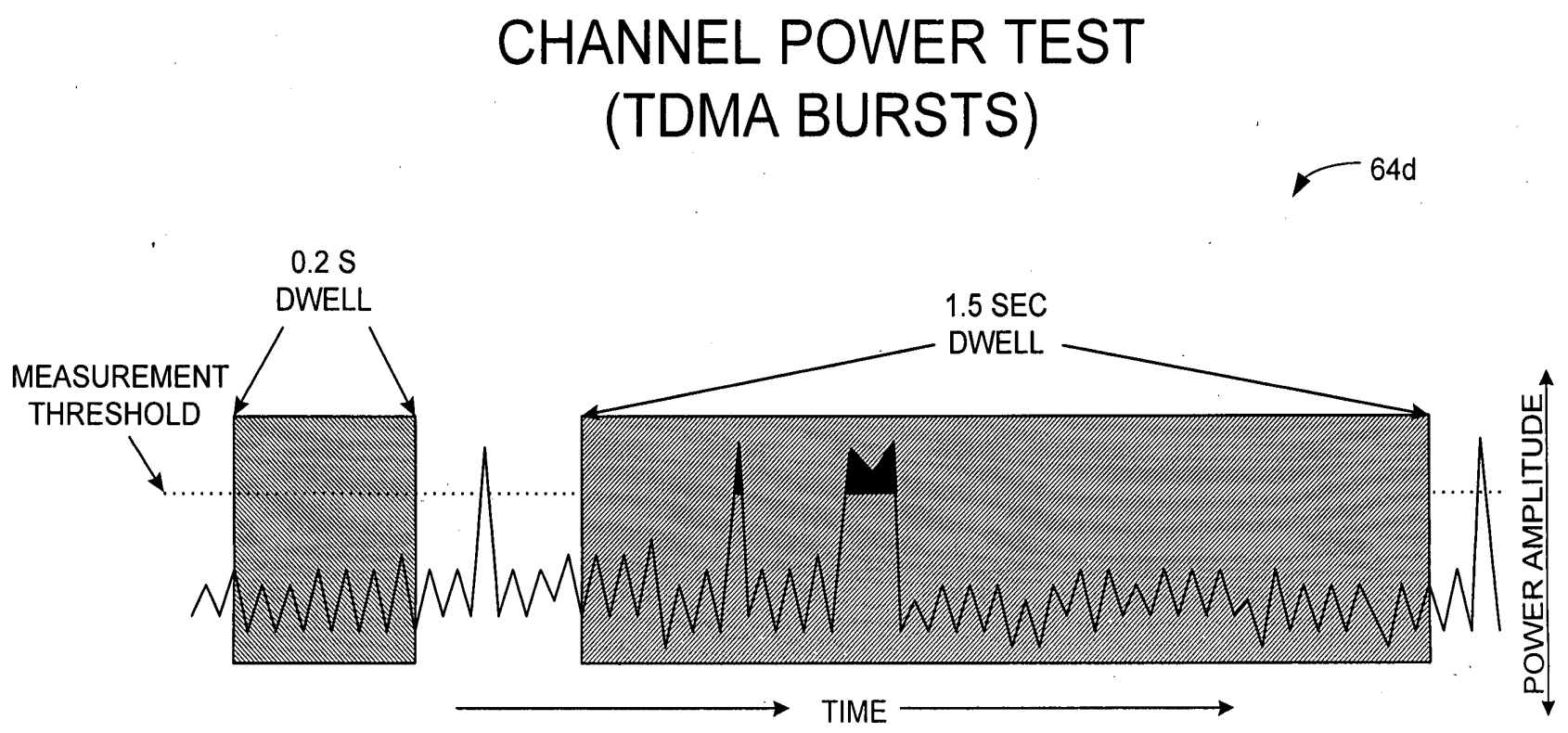


FIG. 3K

Scanned

C/N TEST (CHANNEL)

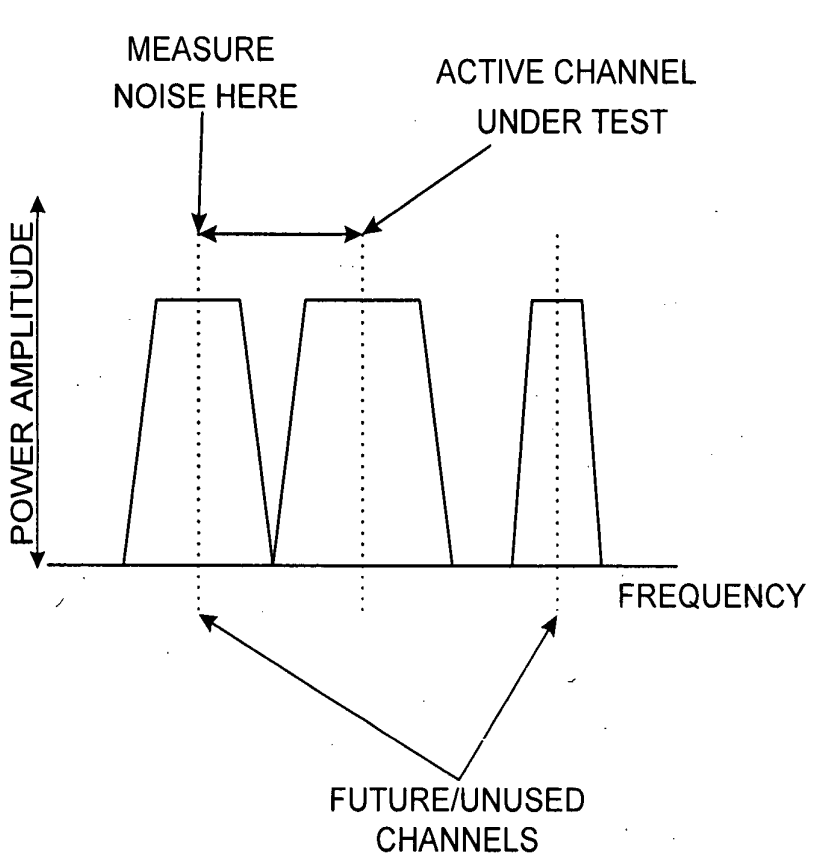


FIG. 3L

6602II "Enhanced

BURST COUNTER TEST (CHANNEL)

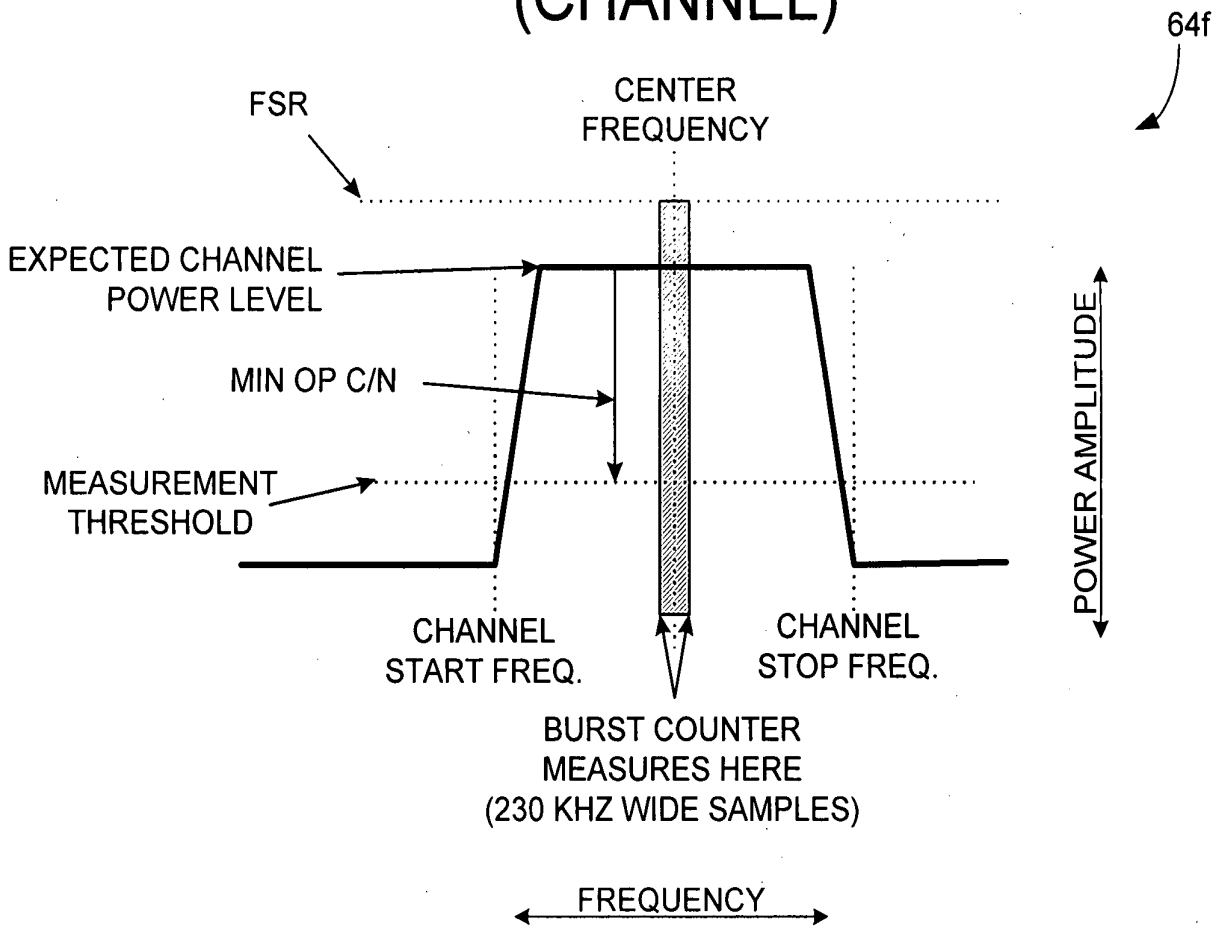


FIG. 3M

PERCENT AVAILABILITY TEST (CHANNEL)

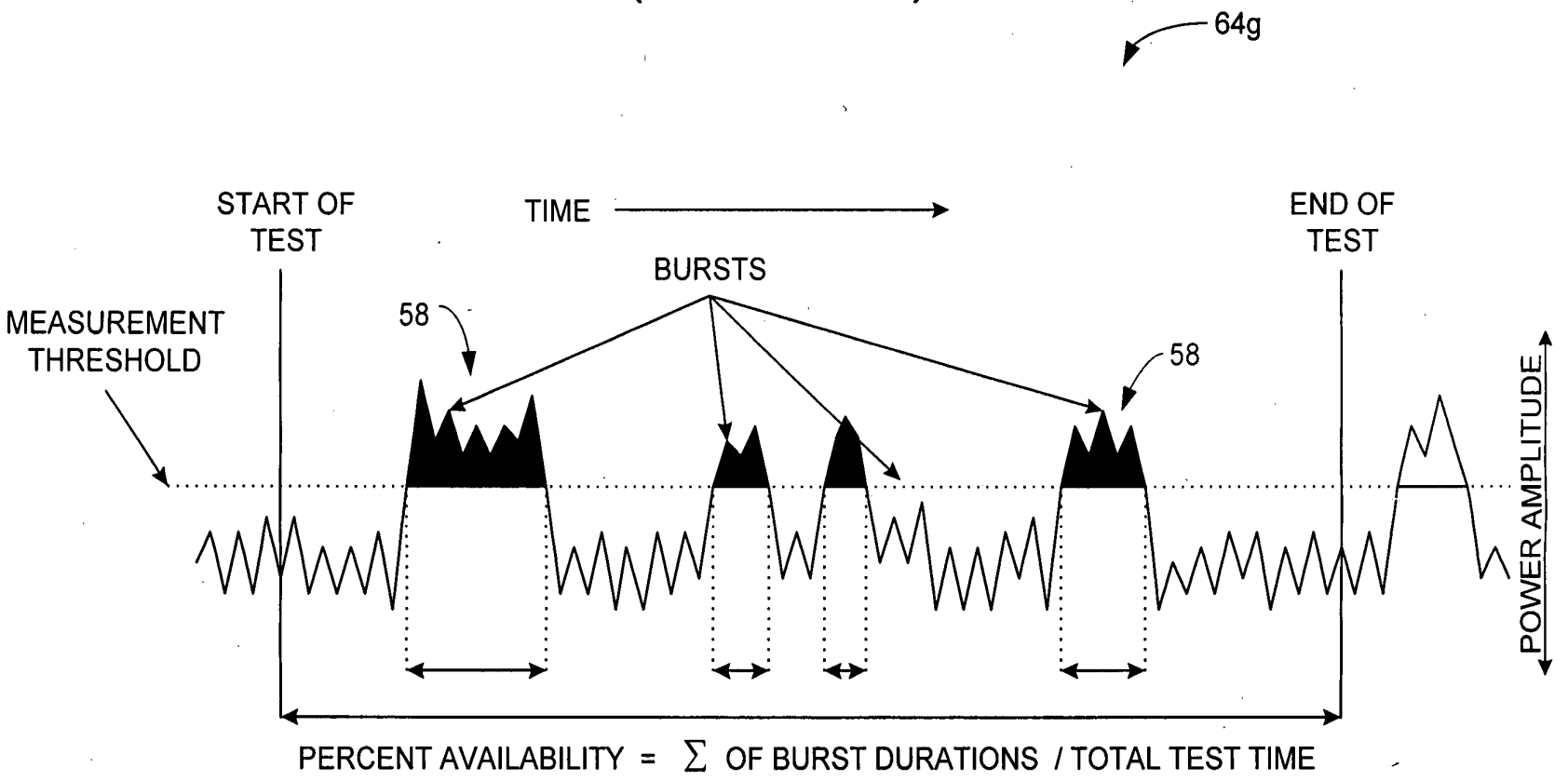


FIG. 3N

PERCENT AVAILABILITY TEST (ACTIVE CHANNELS)

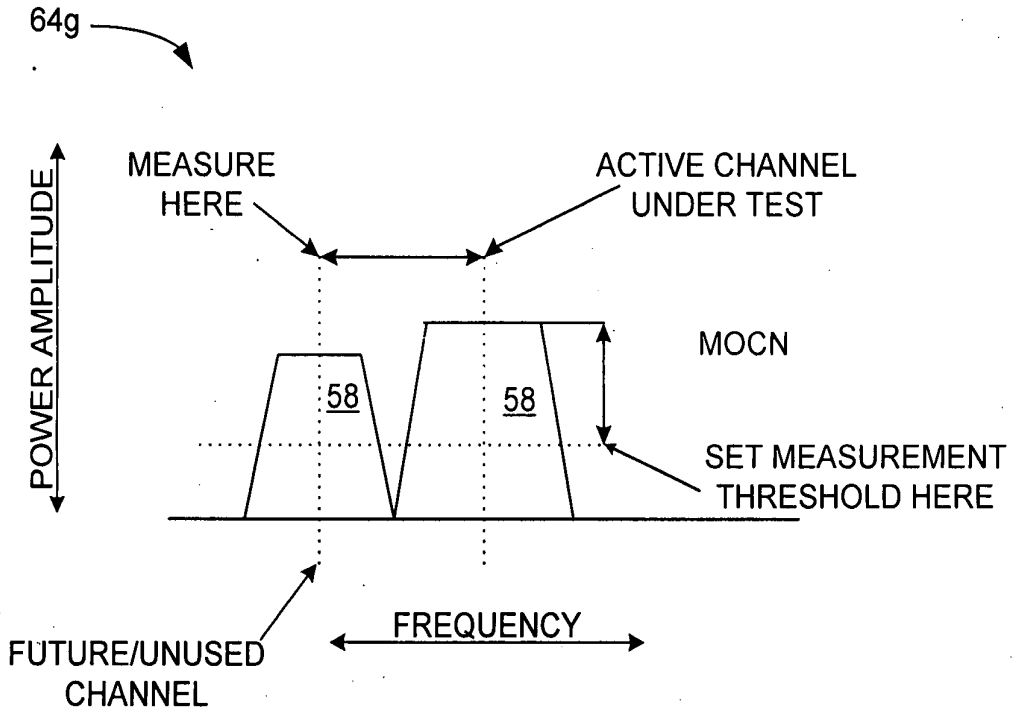


FIG. 3O

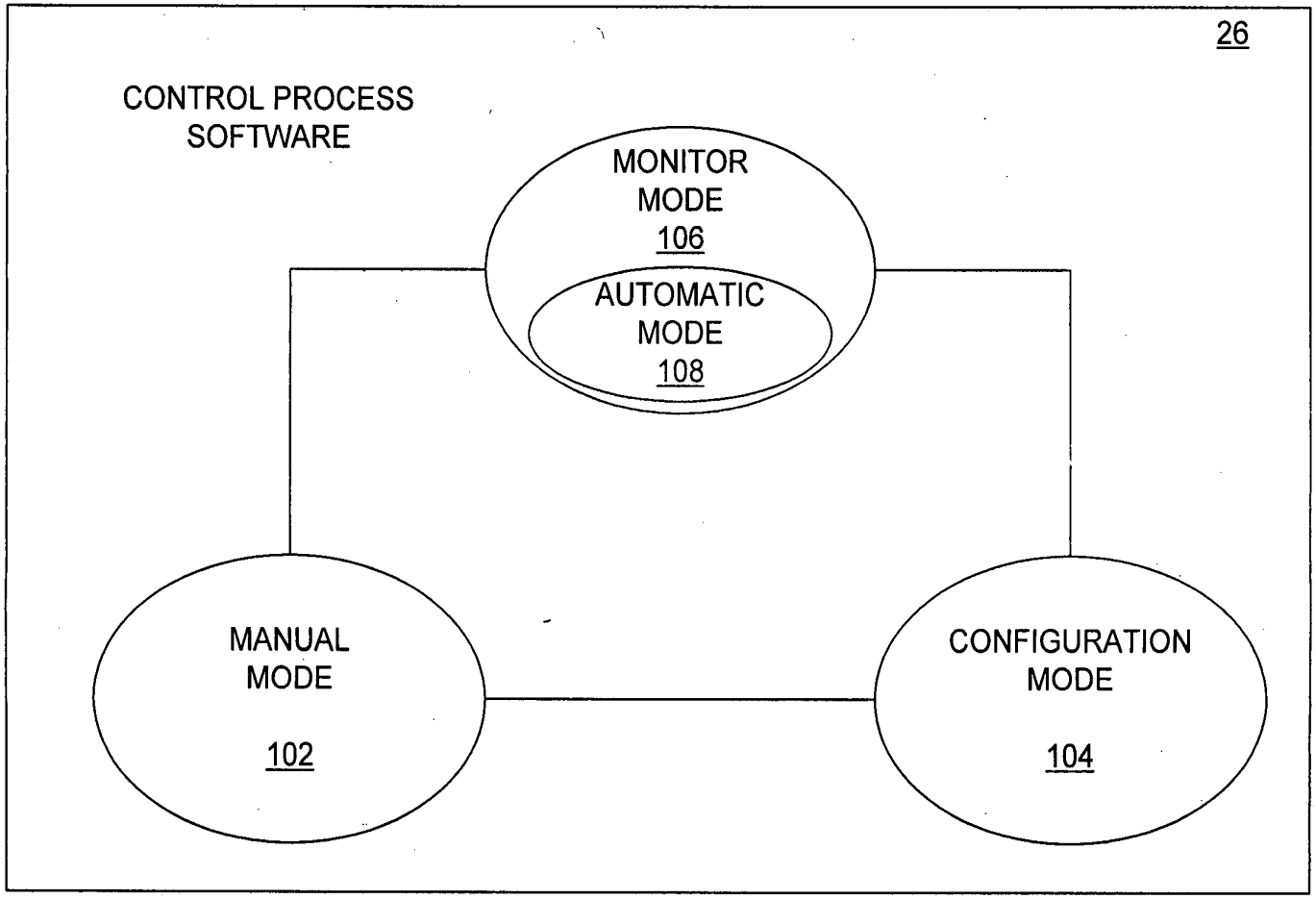

26
CONTROL PROCESS SOFTWARE
MONITOR MODE
106
AUTOMATIC MODE
108
MANUAL MODE
102
CONFIGURATION MODE
104

FIG. 4

FIG. 5A

CHANNEL PLAN SETUP

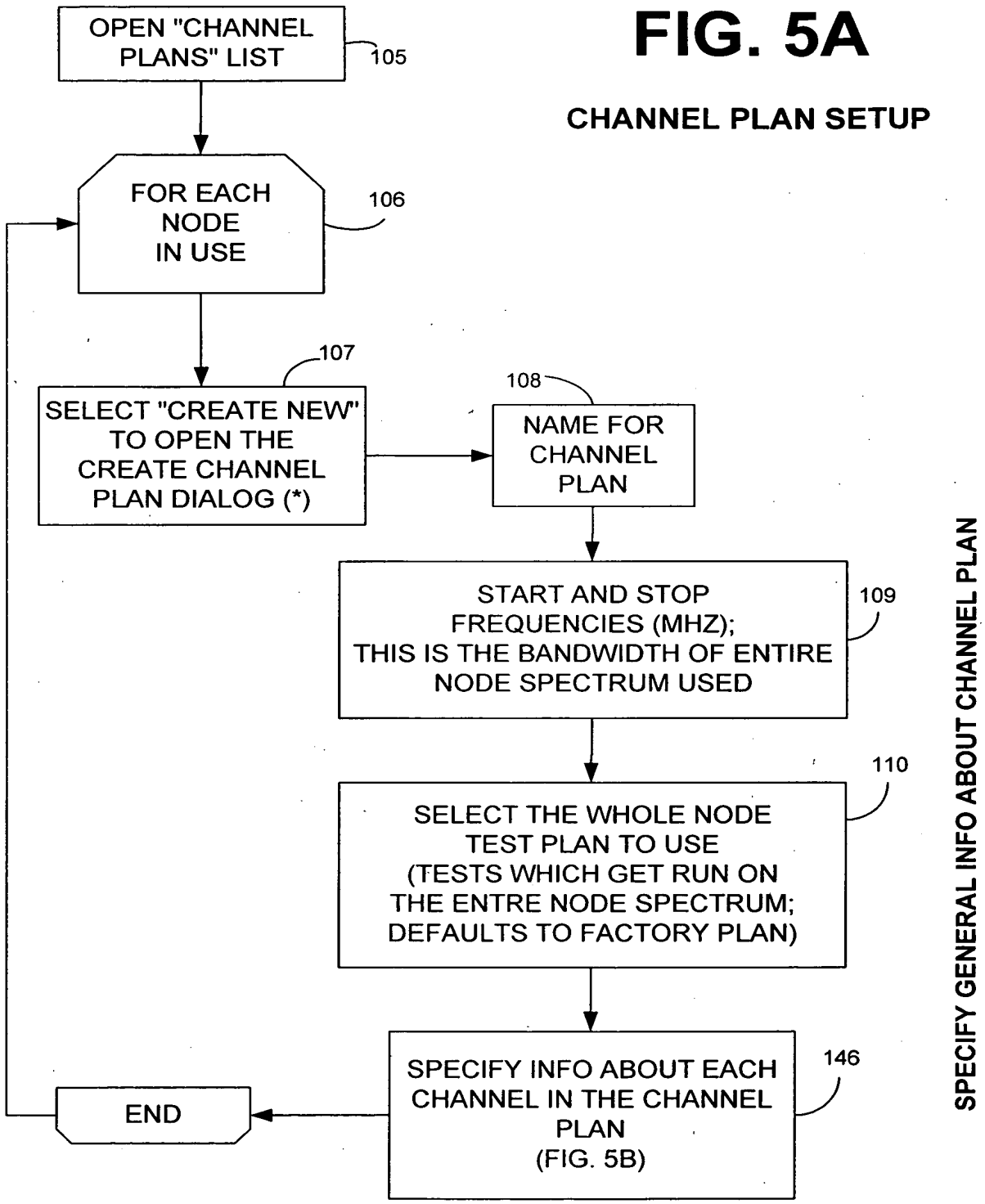
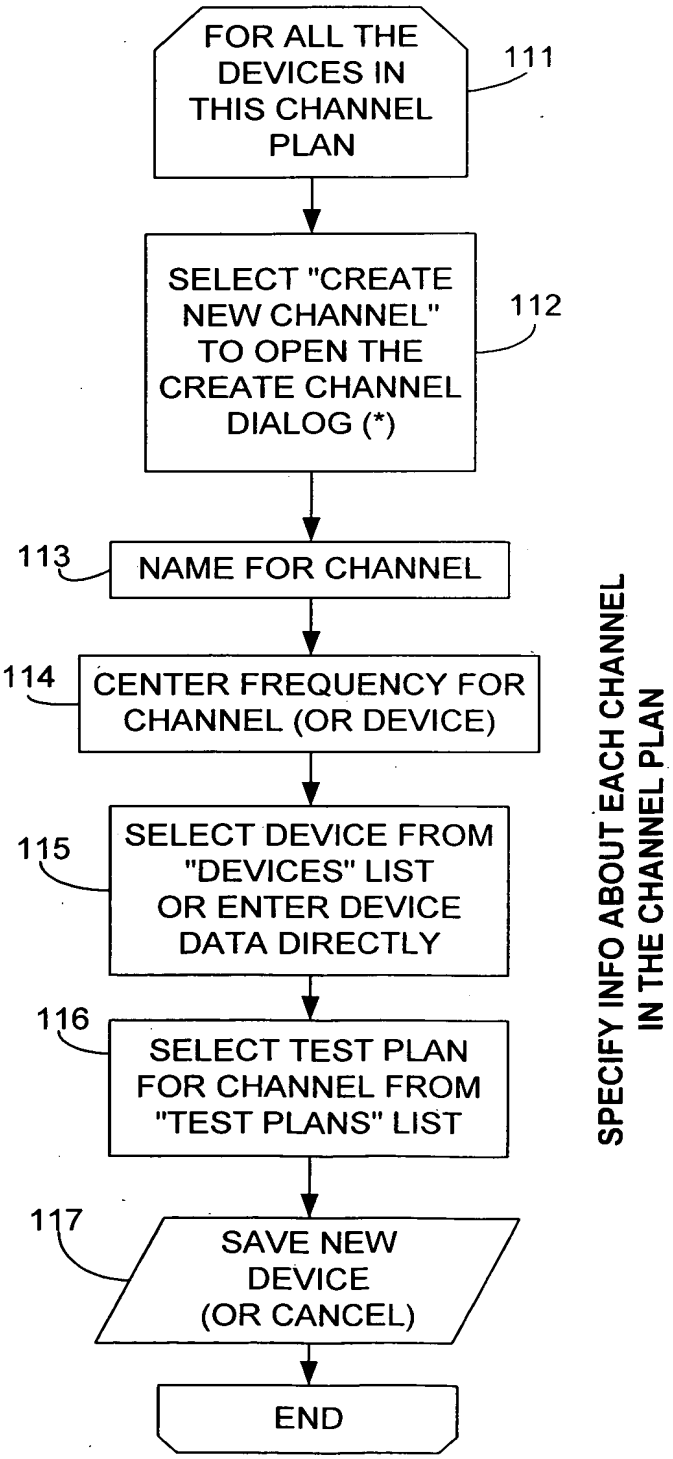


FIG. 5B

CHANNEL PLAN SETUP (CONTINUED)



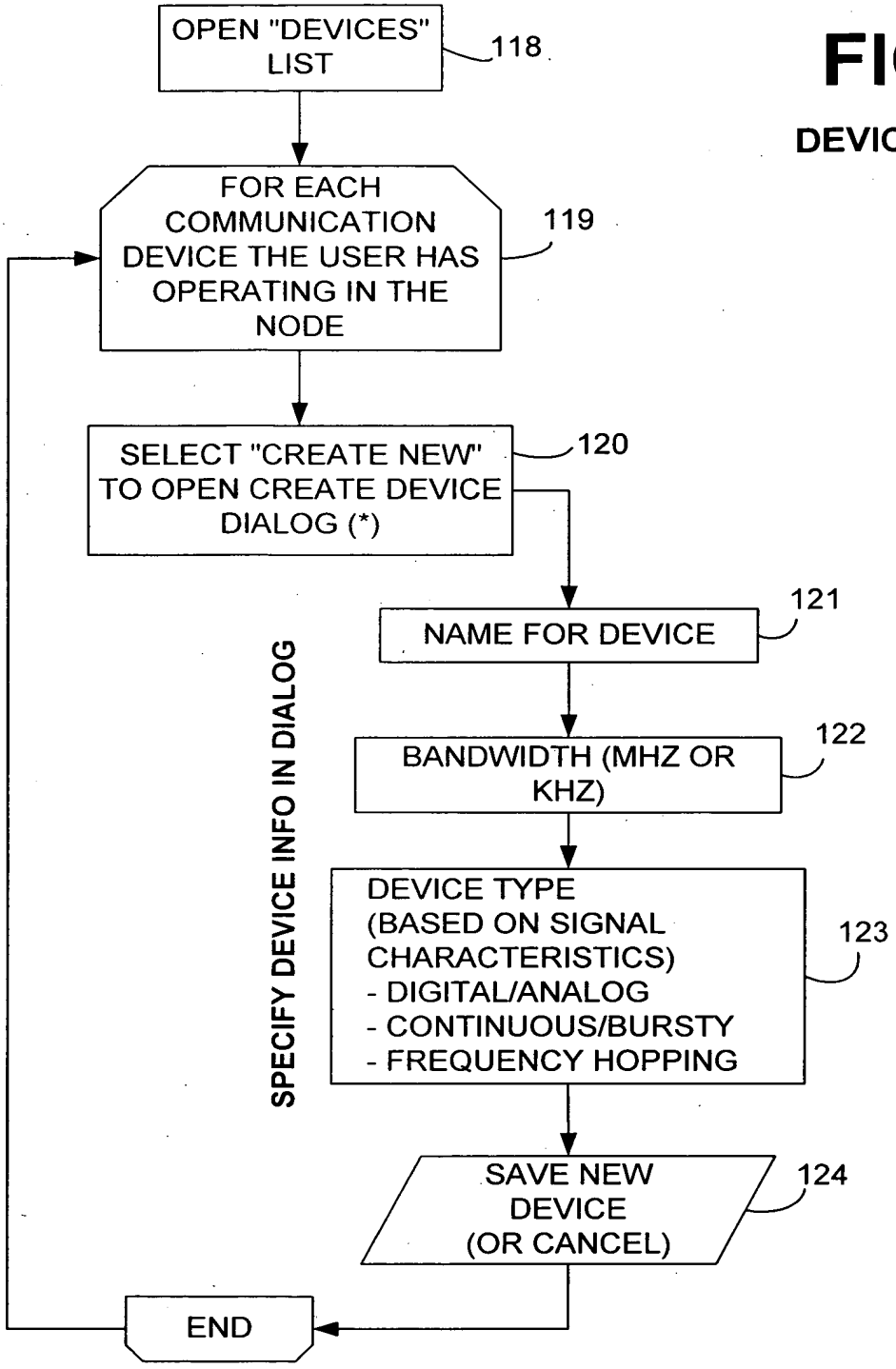


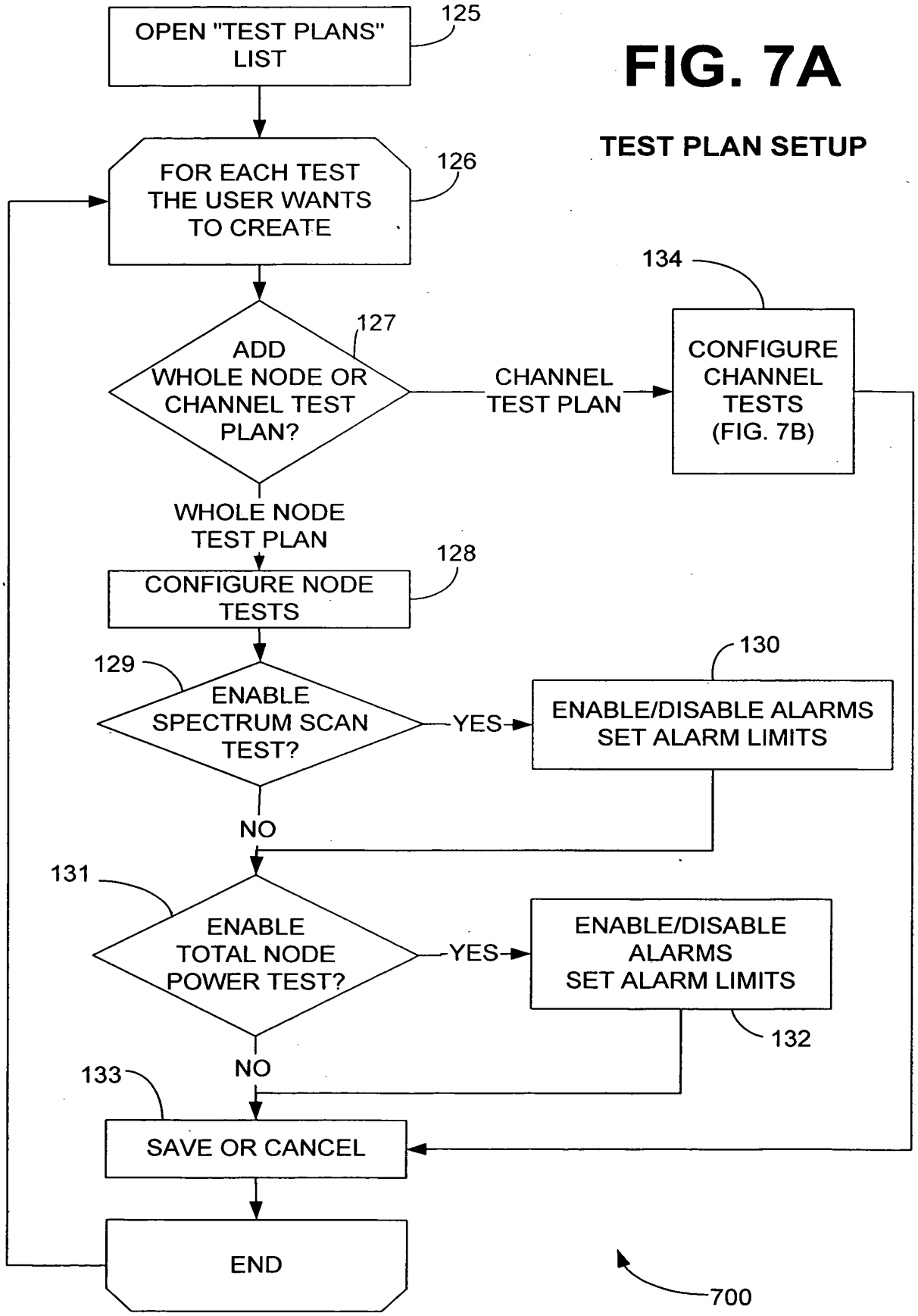
FIG. 6

DEVICE SETUP

* NOTE: DEVICE LIST DIALOG ALSO ALLOWS USER TO EDIT OR DELETE DEVICES.

FIG. 7A

TEST PLAN SETUP



TEST PLAN SETUP (CONTINUED)

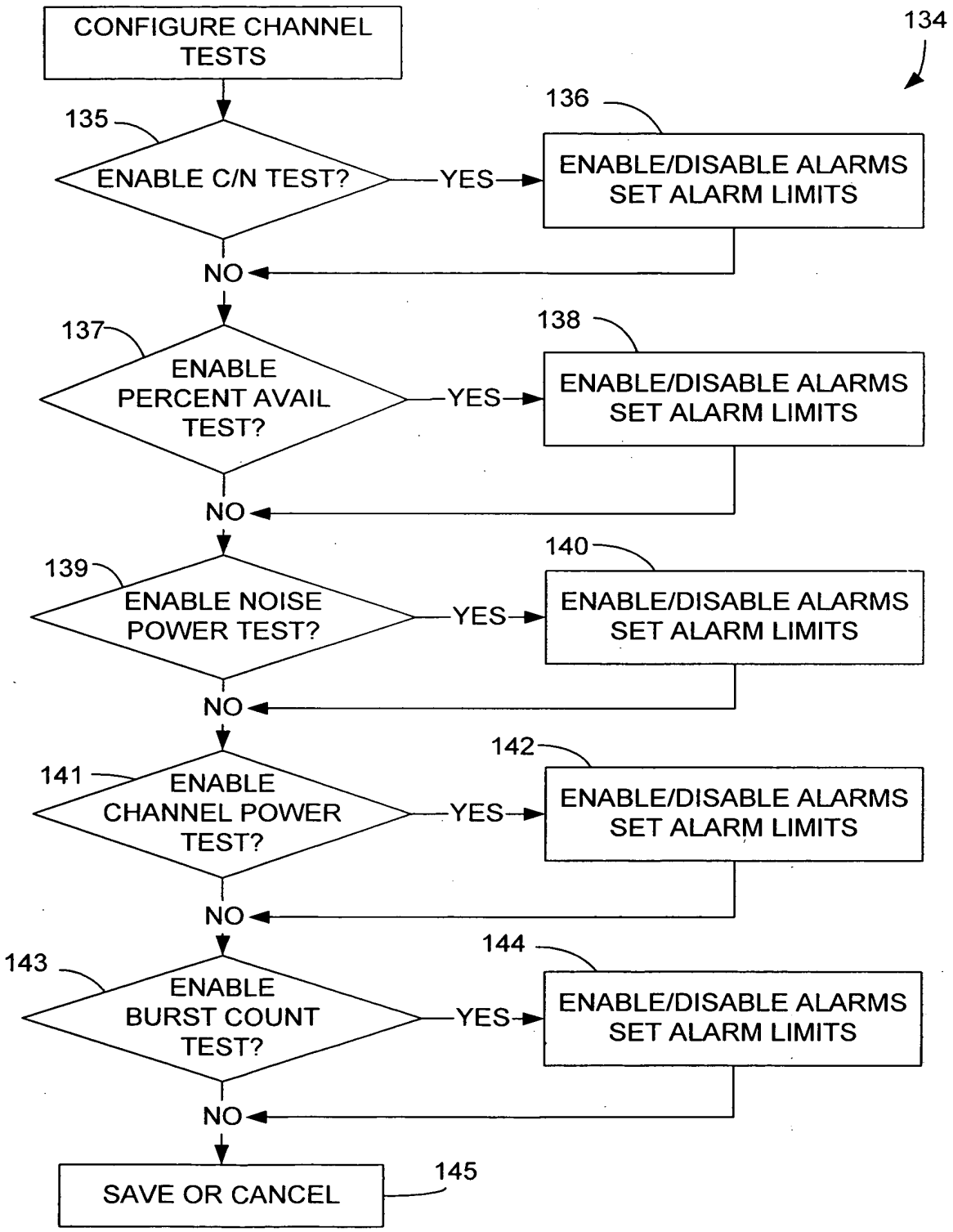


FIG. 7B

AUTOMATIC MODE
(FIRST EMBODIMENT; EMPLOYS ROUND ROBIN ALGORITHM)

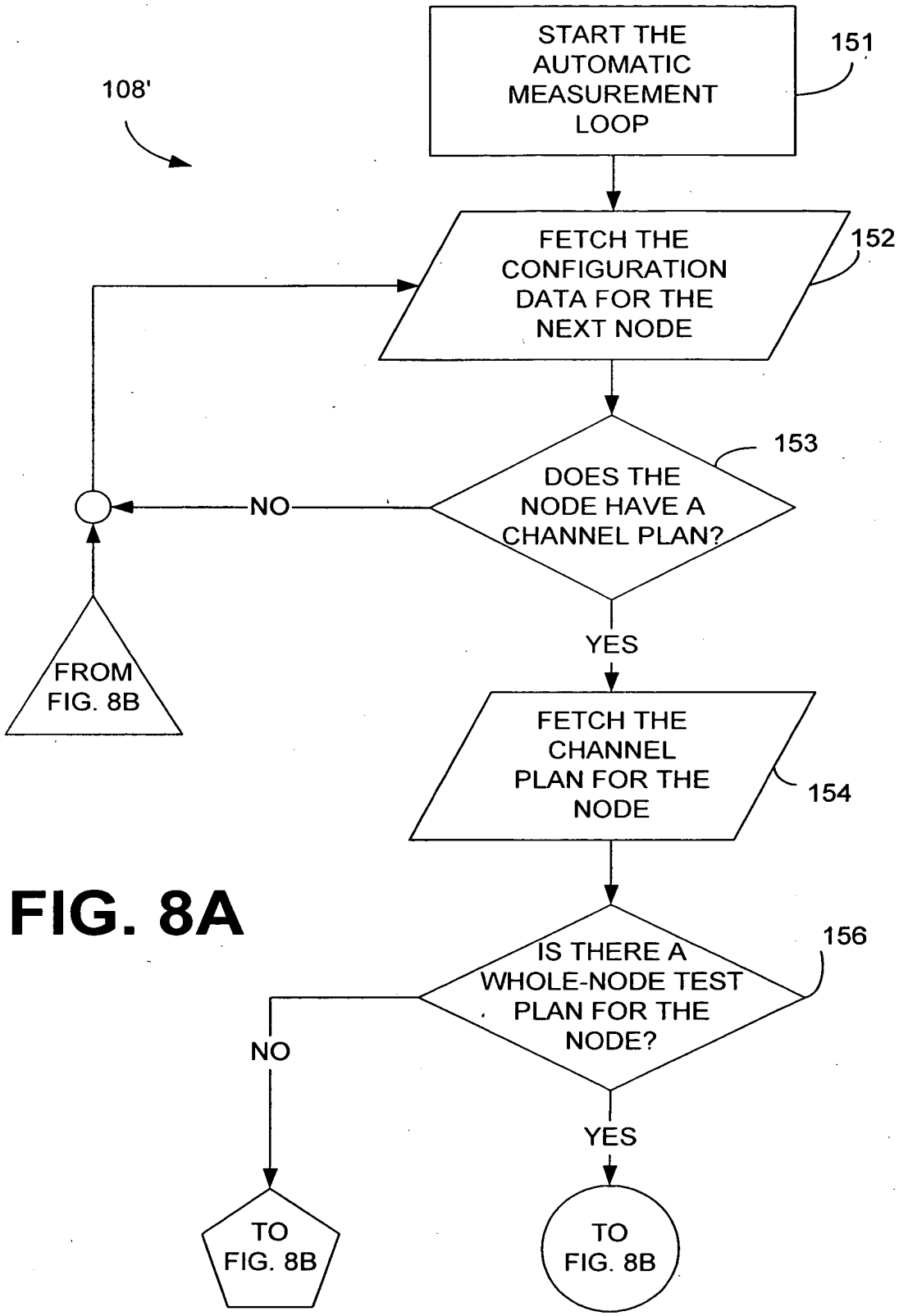


FIG. 8A

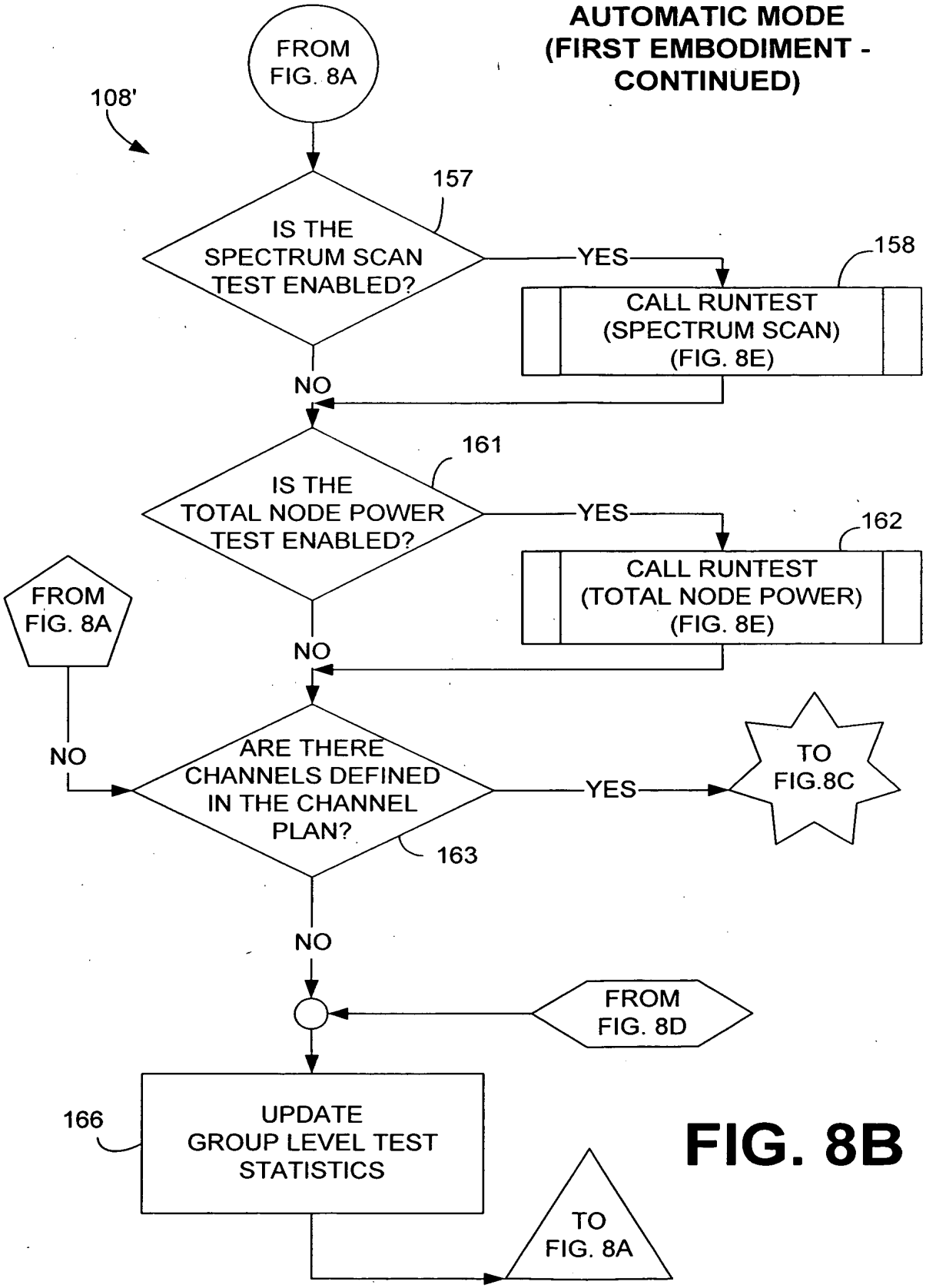

AUTOMATIC MODE
(FIRST EMBODIMENT - CONTINUED)
FROM FIG. 8A
108'
157
IS THE SPECTRUM SCAN TEST ENABLED?
YES
158
CALL RUNTEST (SPECTRUM SCAN) (FIG. 8E)
NO
161
IS THE TOTAL NODE POWER TEST ENABLED?
YES
162
CALL RUNTEST (TOTAL NODE POWER) (FIG. 8E)
NO
FROM FIG. 8A
NO
ARE THERE CHANNELS DEFINED IN THE CHANNEL PLAN?
YES
TO FIG.8C
163
NO
FROM FIG. 8D
166
UPDATE GROUP LEVEL TEST STATISTICS
TO FIG. 8A

FIG. 8B

AUTOMATIC MODE
(FIRST EMBODIMENT - CONTINUED)

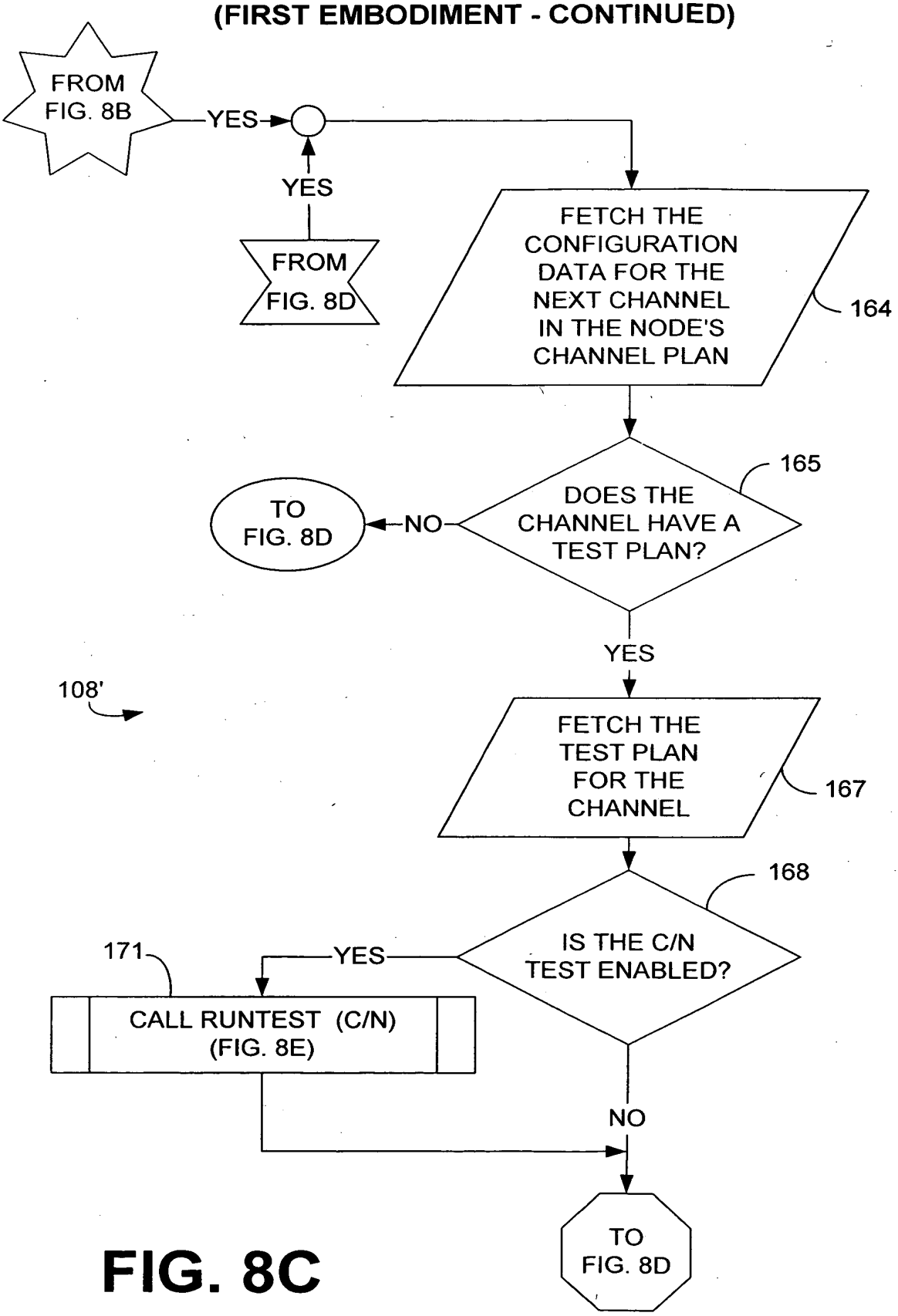


FIG. 8C

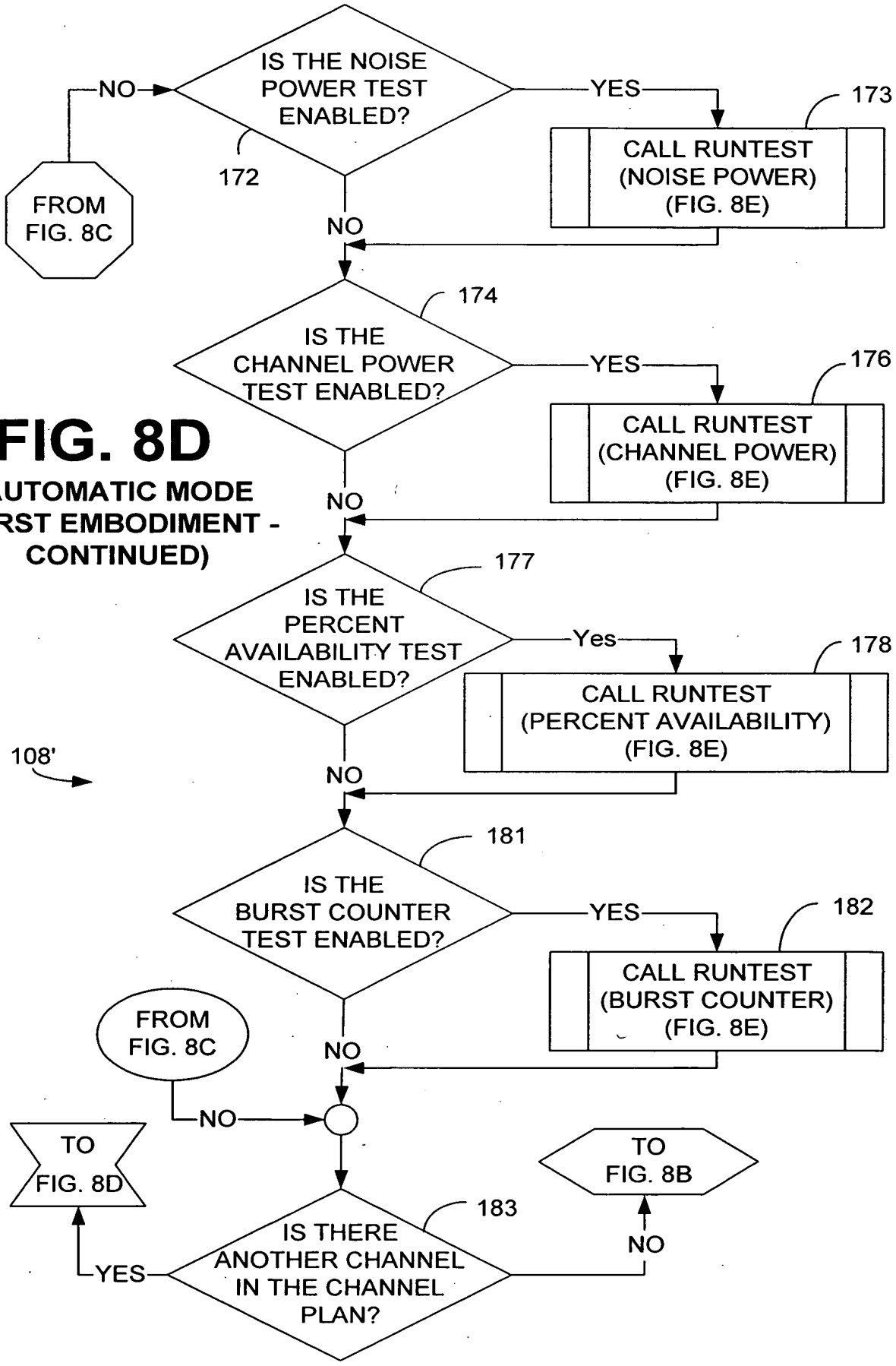


FIG. 8D

AUTOMATIC MODE (FIRST EMBODIMENT - CONTINUED)

AUTOMATIC MODE
(FIRST EMBODIMENT - CONTINUED)

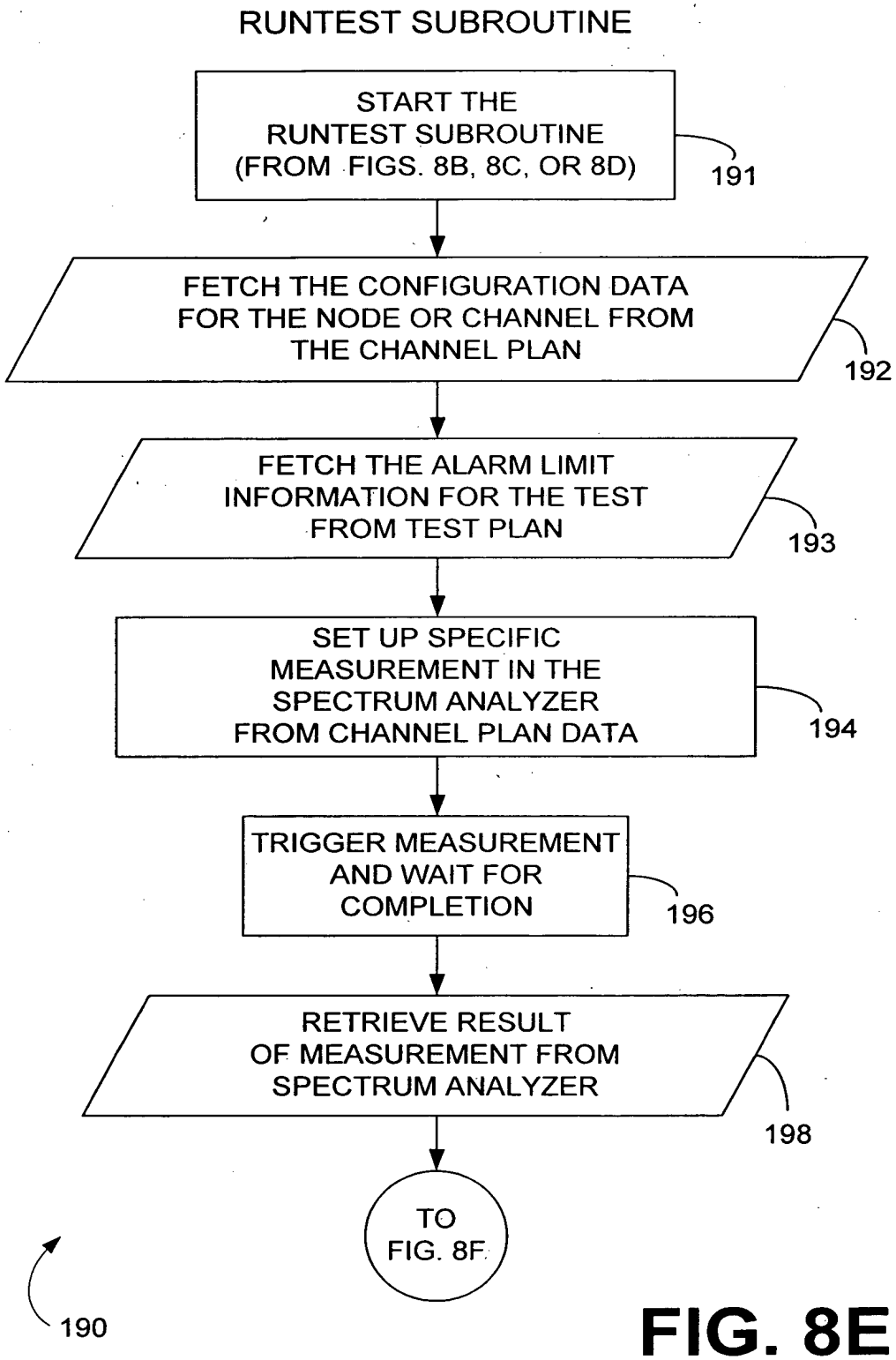


FIG. 8E

AUTOMATIC MODE
(FIRST EMBODIMENT - CONTINUED)

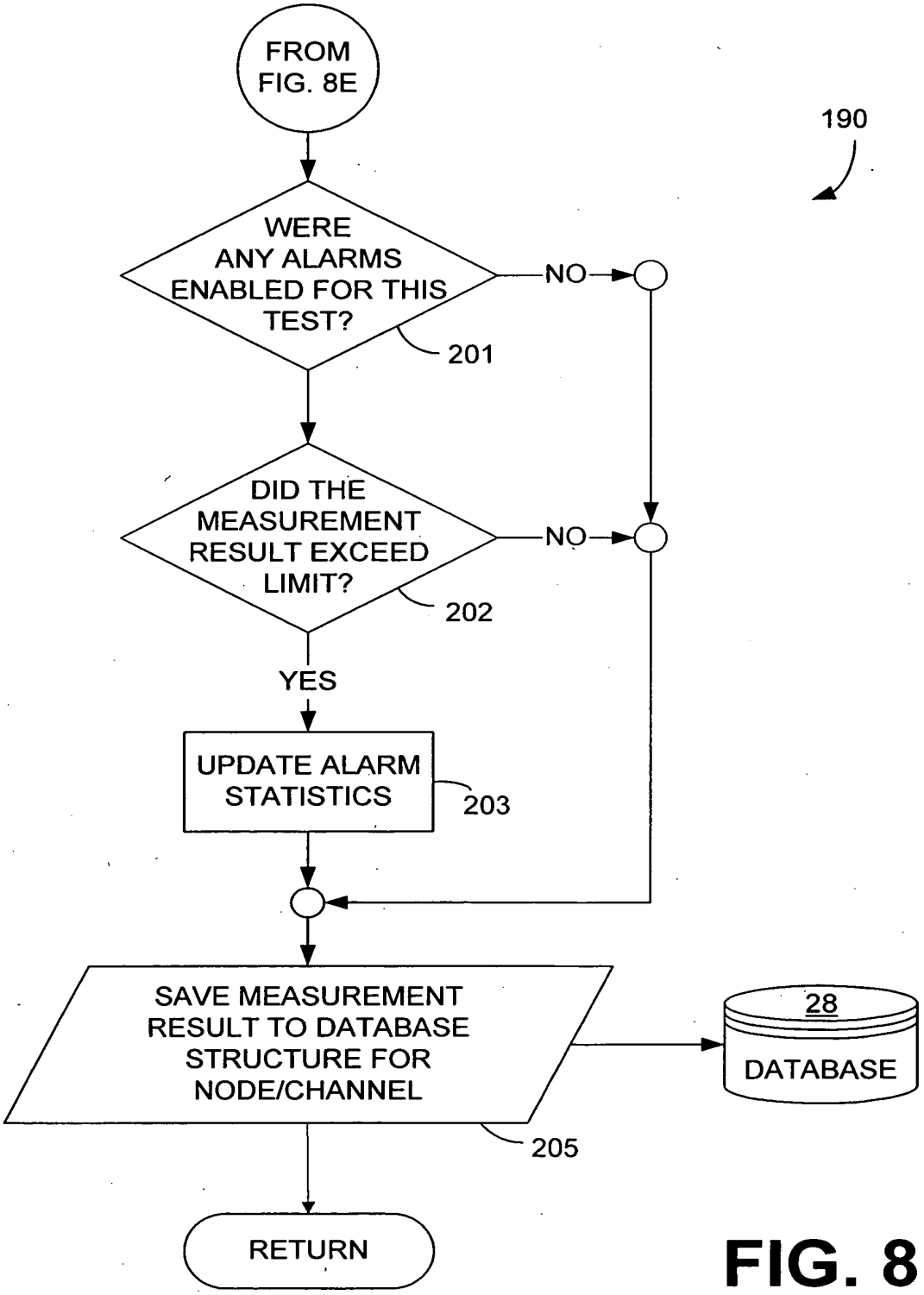


FIG. 8F

AUTOMATIC MODE
(SECOND EMBODIMENT; EMPLOYS SMART SCANNING ALGORITHM)

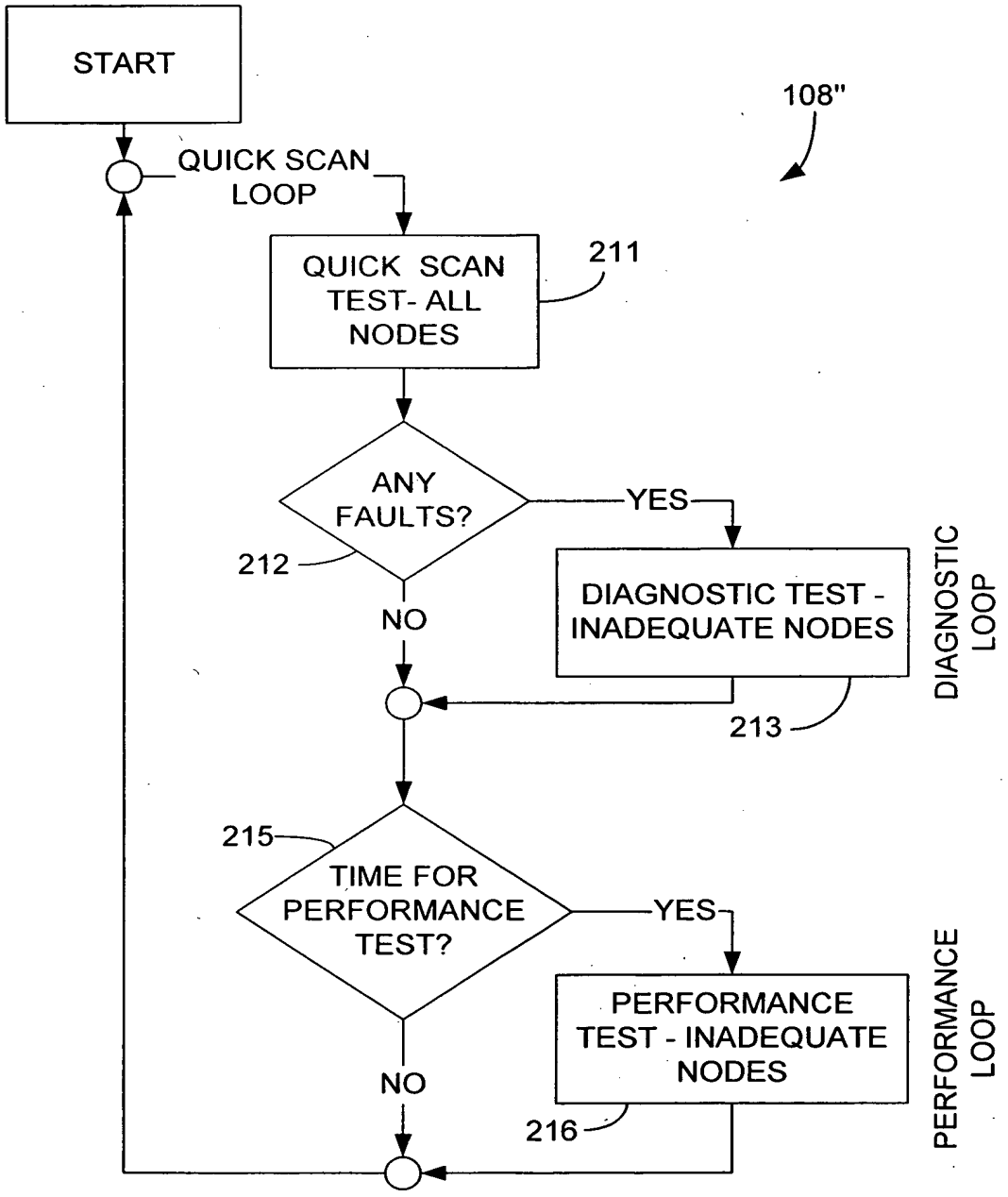


FIG. 9A

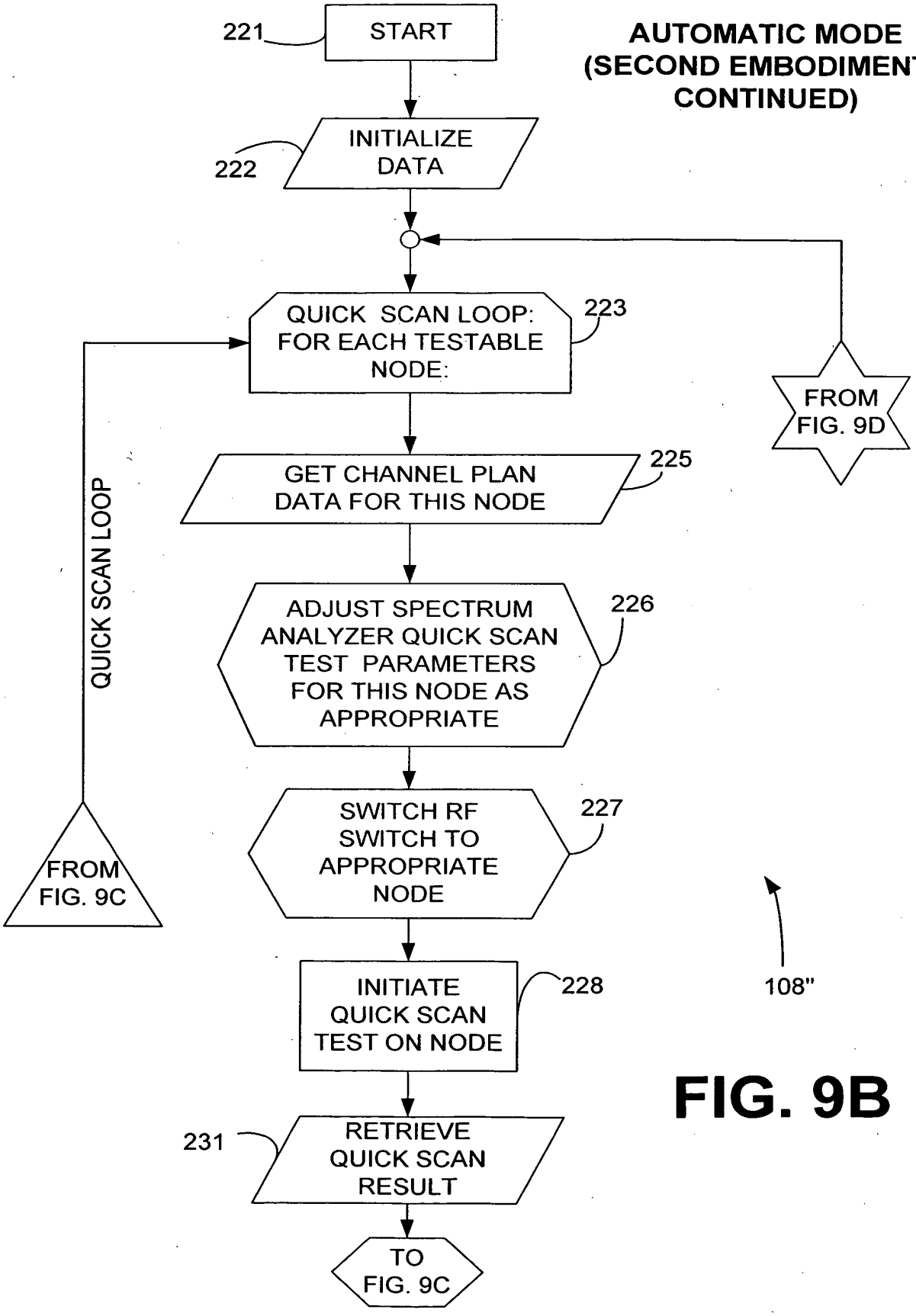

AUTOMATIC MODE
(SECOND EMBODIMENT - CONTINUED)
221
START
INITIALIZE DATA
222
QUICK SCAN LOOP: FOR EACH TESTABLE NODE:
223
FROM FIG. 9D
GET CHANNEL PLAN DATA FOR THIS NODE
225
ADJUST SPECTRUM ANALYZER QUICK SCAN TEST PARAMETERS FOR THIS NODE AS APPROPRIATE
226
SWITCH RF SWITCH TO APPROPRIATE NODE
227
QUICK SCAN LOOP
FROM FIG. 9C
INITIATE QUICK SCAN TEST ON NODE
228
108"
RETRIEVE QUICK SCAN RESULT
231
TO FIG. 9C

FIG. 9B

AUTOMATIC MODE
(SECOND EMBODIMENT - CONTINUED)

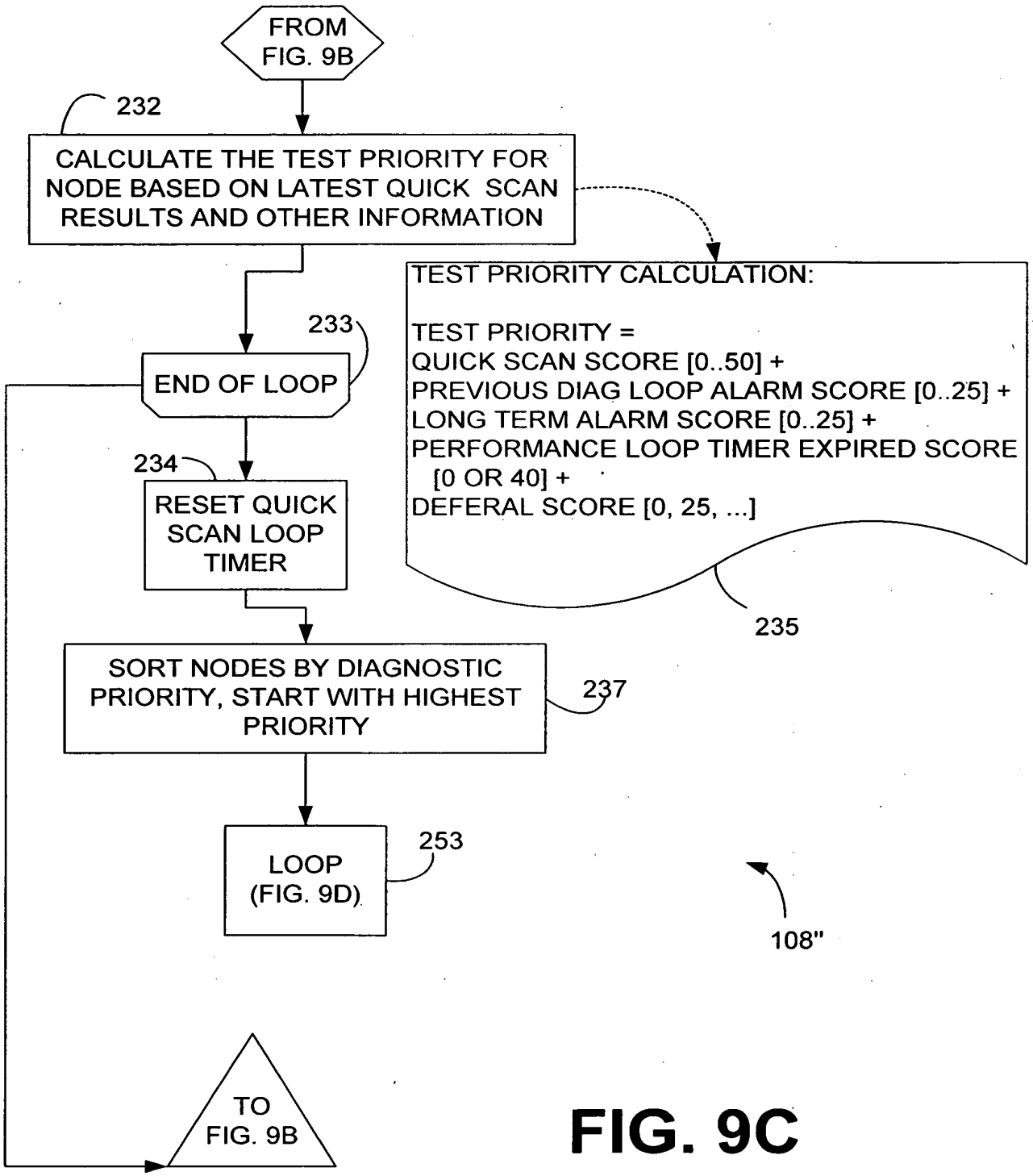


FIG. 9C

AUTOMATIC MODE
(SECOND EMBODIMENT - CONTINUED)

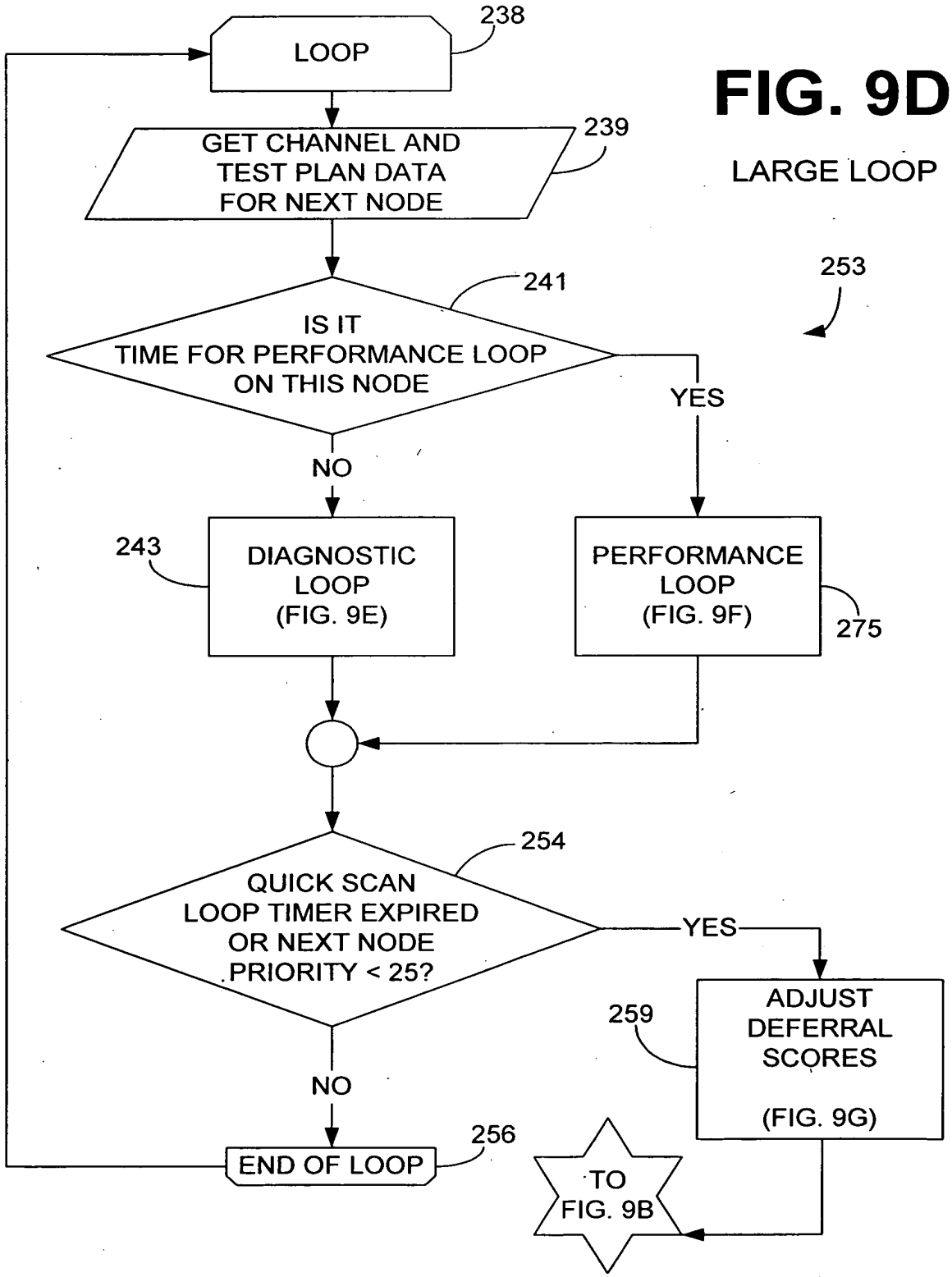


FIG. 9D

LARGE LOOP

AUTOMATIC MODE
(SECOND EMBODIMENT - CONTINUED)

DIAGNOSTIC LOOP

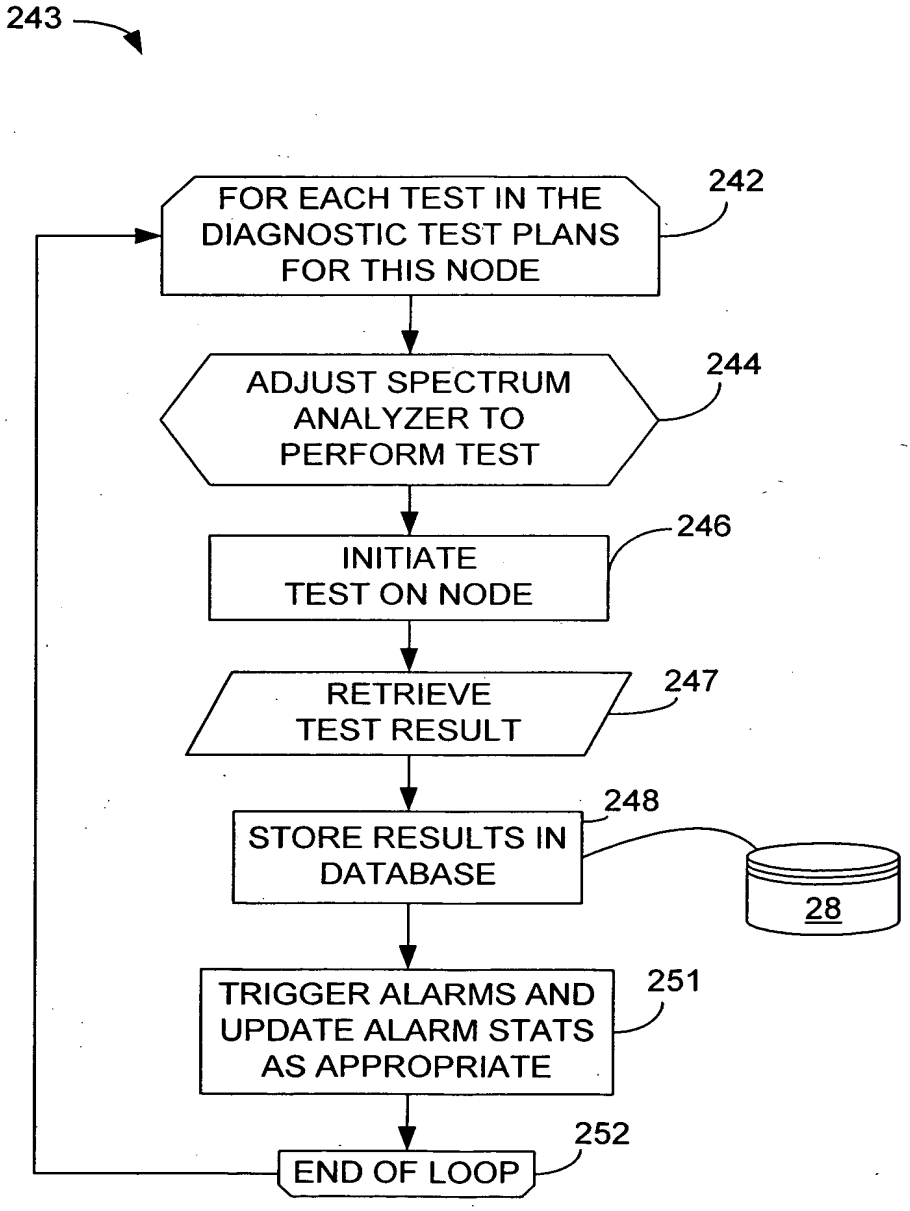


FIG. 9E

AUTOMATIC MODE
(SECOND EMBODIMENT - CONTINUED)

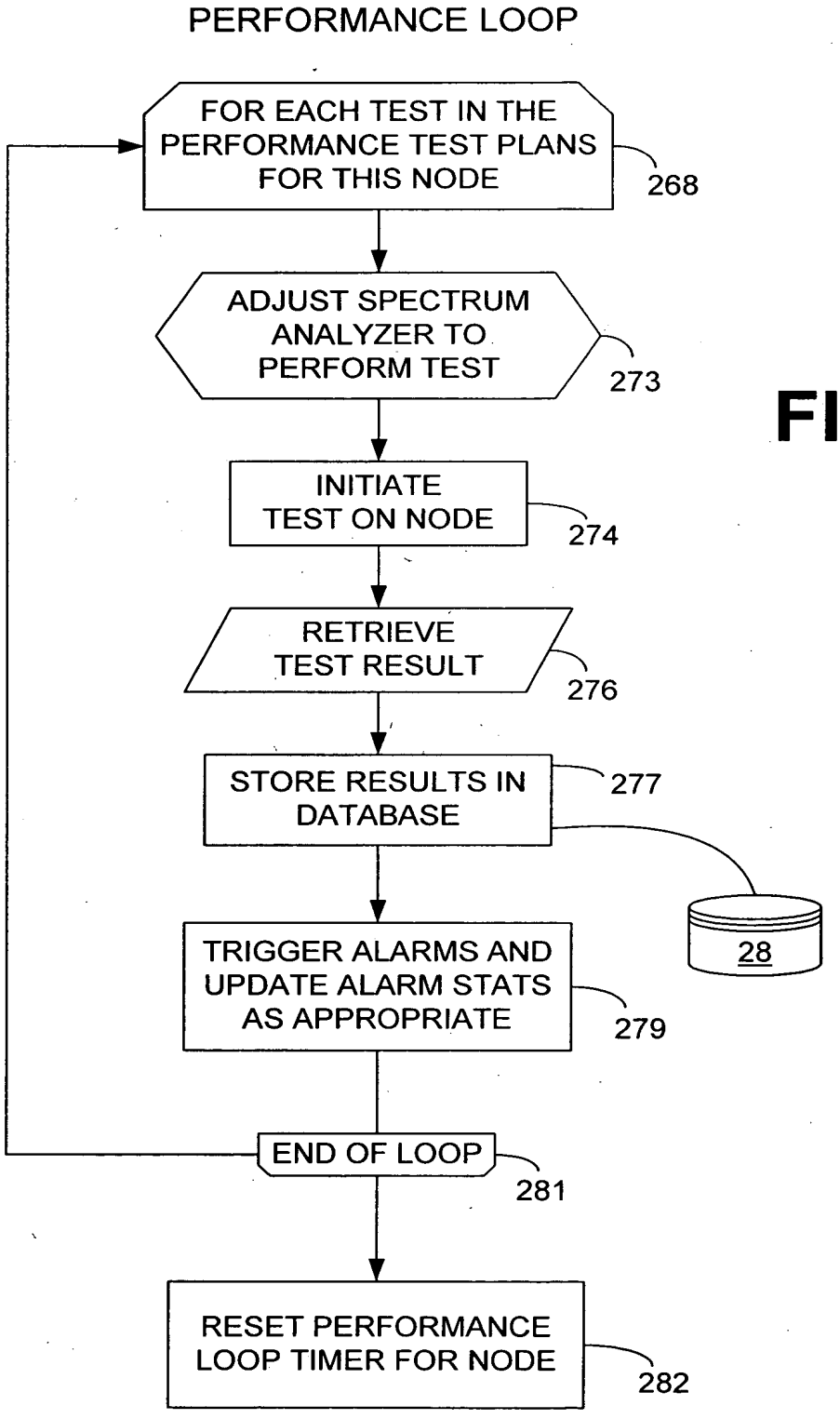


FIG. 9F

AUTOMATIC MODE
(SECOND EMBODIMENT - CONTINUED)

ADJUST DEFERAL SCORES LOOP

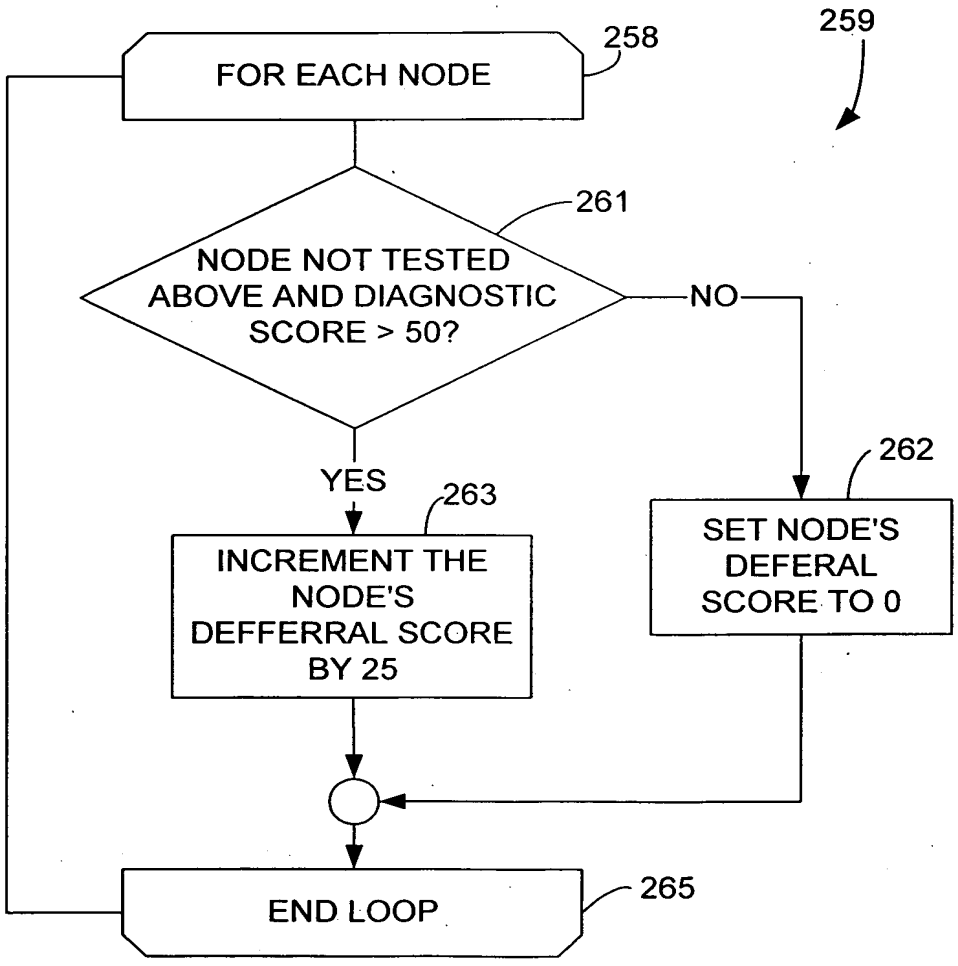
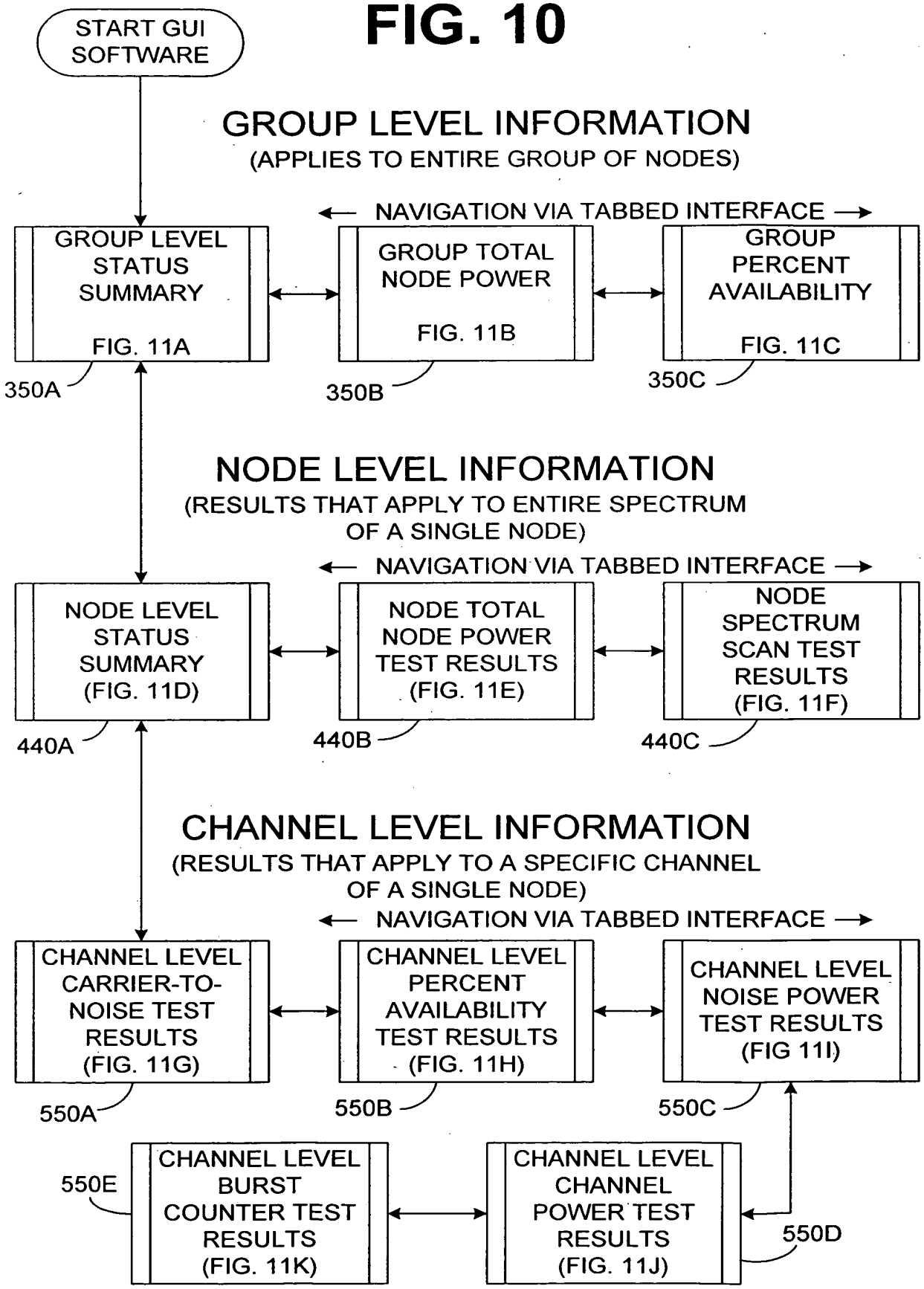


FIG. 9G

FIG. 10


START GUI SOFTWARE
GROUP LEVEL INFORMATION
(APPLIES TO ENTIRE GROUP OF NODES)
NAVIGATION VIA TABBED INTERFACE
GROUP LEVEL STATUS SUMMARY
FIG. 11A
350A
GROUP TOTAL NODE POWER
FIG. 11B
350B
GROUP PERCENT AVAILABILITY
FIG. 11C
350C
NODE LEVEL INFORMATION
(RESULTS THAT APPLY TO ENTIRE SPECTRUM OF A SINGLE NODE)
NAVIGATION VIA TABBED INTERFACE
NODE LEVEL STATUS SUMMARY (FIG. 11D)
440A
NODE TOTAL NODE POWER TEST RESULTS (FIG. 11E)
440B
NODE SPECTRUM SCAN TEST RESULTS (FIG. 11F)
440C
CHANNEL LEVEL INFORMATION
(RESULTS THAT APPLY TO A SPECIFIC CHANNEL OF A SINGLE NODE)
NAVIGATION VIA TABBED INTERFACE
CHANNEL LEVEL CARRIER-TO-NOISE TEST RESULTS (FIG. 11G)
550A
CHANNEL LEVEL PERCENT AVAILABILITY TEST RESULTS (FIG. 11H)
550B
CHANNEL LEVEL NOISE POWER TEST RESULTS (FIG 11I)
550C
550E
CHANNEL LEVEL BURST COUNTER TEST RESULTS (FIG. 11K)
CHANNEL LEVEL CHANNEL POWER TEST RESULTS (FIG. 11J)
550D

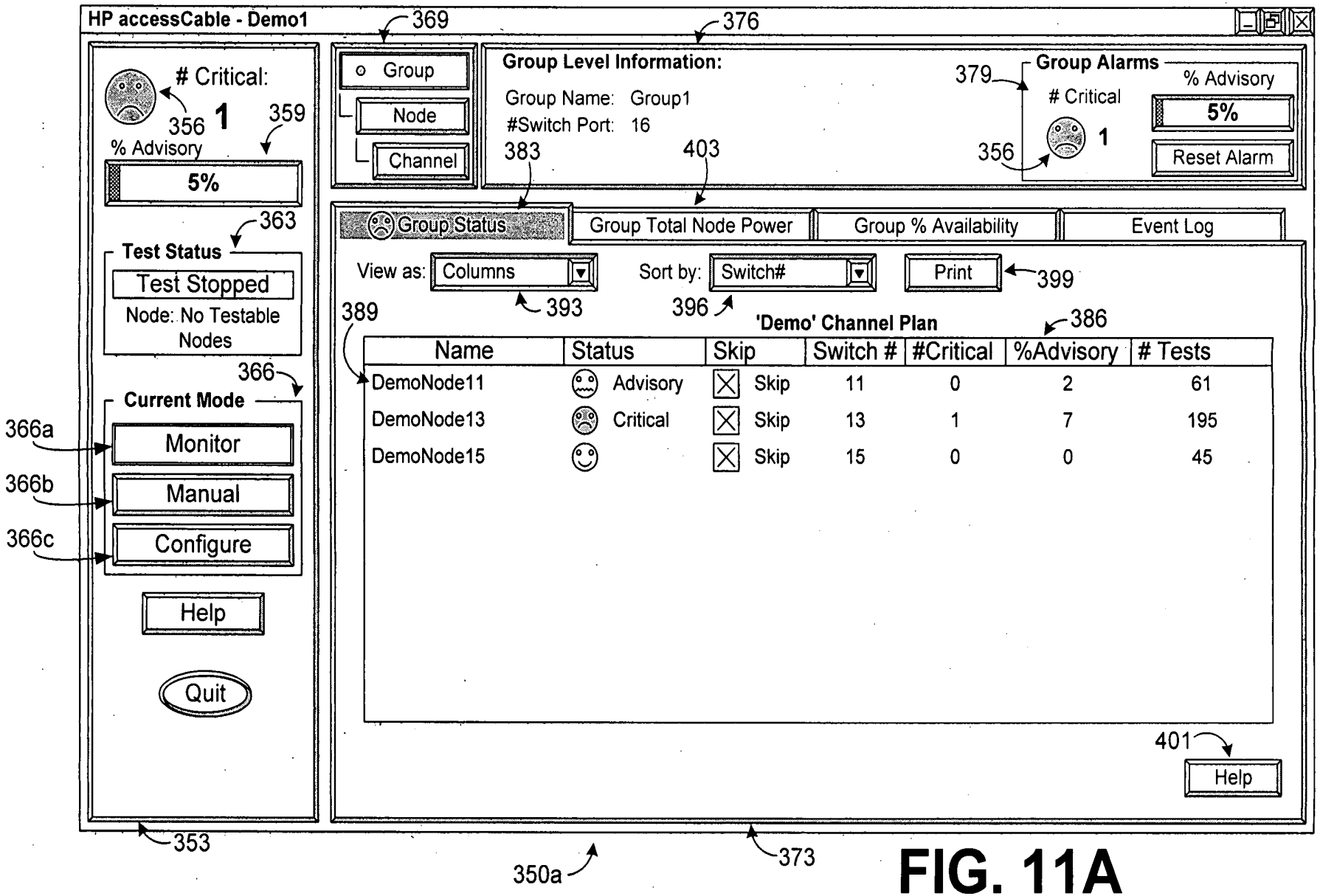

HP accessCable - Demo1
369
376
Critical:
356
1
359
% Advisory
5%
363
Test Status
Test Stopped
Node: No Testable Nodes
366
Current Mode
366a
Monitor
366b
Manual
366c
Configure
Help
Quit
353
Group
Node
Channel
Group Level Information:
Group Name: Group1
#Switch Port: 16
379
Group Alarms
Critical
1
356
% Advisory
5%
Reset Alarm
383
403
Group Status
Group Total Node Power
Group % Availability
Event Log
View as: Columns
393
Sort by: Switch#
396
Print
399
389
'Demo' Channel Plan
386
Name
Status
Skip
Switch #
#Critical
%Advisory
Tests
DemoNode11
Advisory
Skip
11
0
2
61
DemoNode13
Critical
Skip
13
1
7
195
DemoNode15
Skip
15
0
0
45
401
Help
350a
373

FIG. 11A

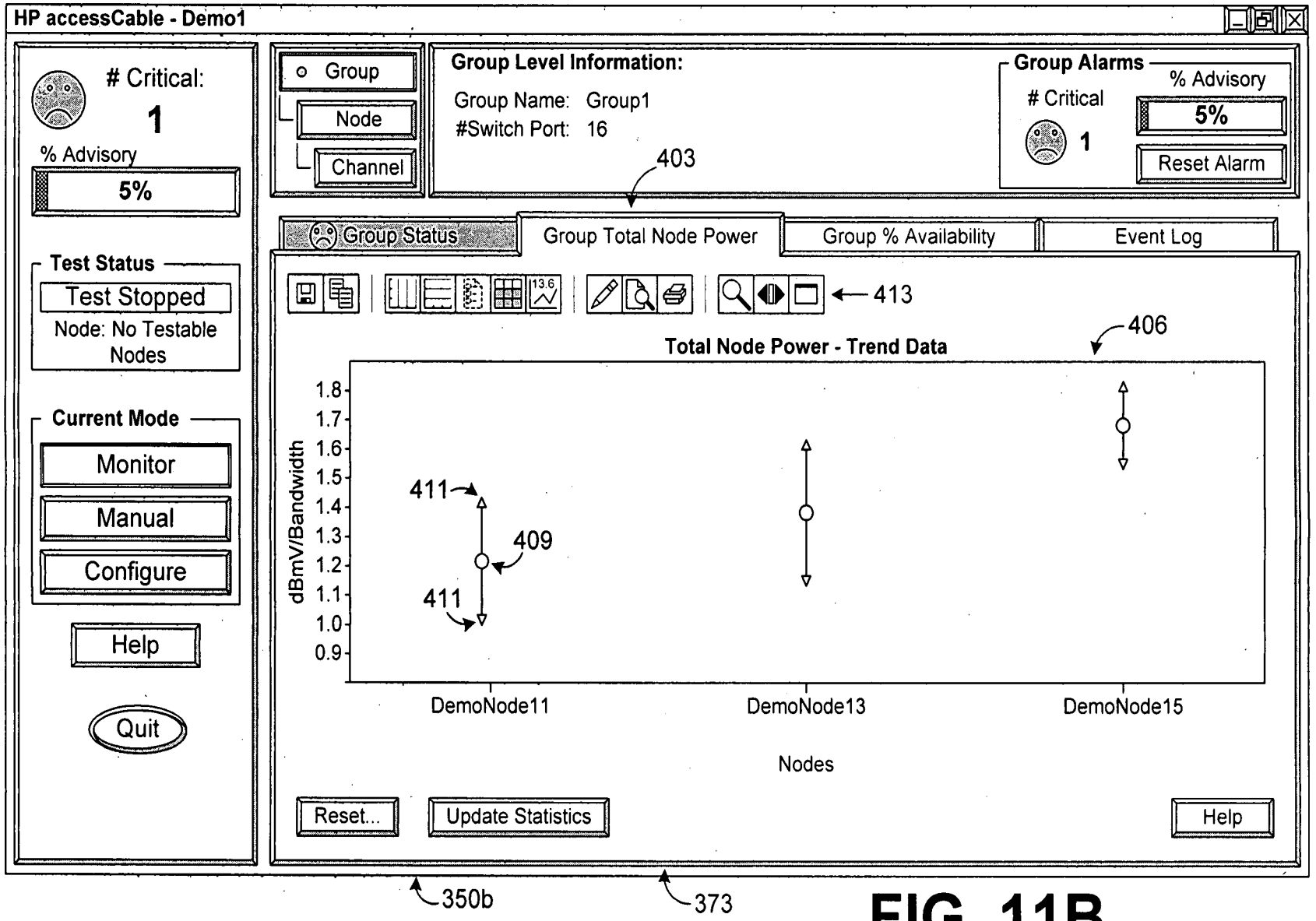

HP accessCable - Demo1
Critical:
1
% Advisory
5%
Test Status
Test Stopped
Node: No Testable Nodes
Current Mode
Monitor
Manual
Configure
Help
Quit
Group
Node
Channel
Group Level Information:
Group Name: Group1
#Switch Port: 16
403
Group Alarms
Critical
1
% Advisory
5%
Reset Alarm
Group Status
Group Total Node Power
Group % Availability
Event Log
413
406
Total Node Power - Trend Data
dBmV/Bandwidth
1.8
1.7
1.6
1.5
1.4
1.3
1.2
1.1
1.0
0.9
411
409
411
DemoNode11
DemoNode13
DemoNode15
Nodes
Reset...
Update Statistics
Help
350b
373

FIG. 11B

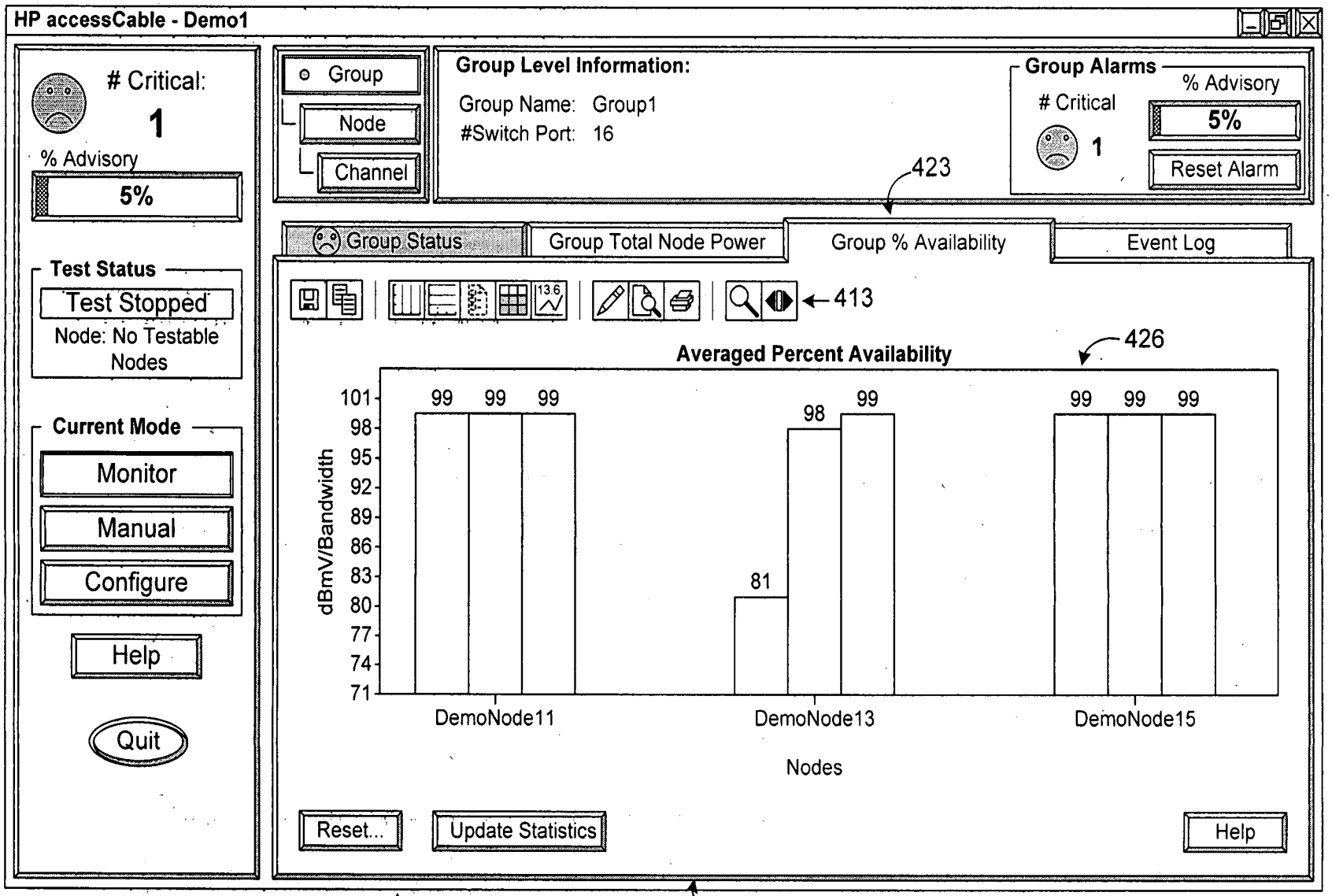

HP accessCable - Demo1
Critical:
1
% Advisory
5%
Test Status
Test Stopped
Node: No Testable Nodes
Current Mode
Monitor
Manual
Configure
Help
Quit
Group
Node
Channel
Group Level Information:
Group Name: Group1
#Switch Port: 16
Group Alarms
Critical
1
% Advisory
5%
Reset Alarm
423
Group Status
Group Total Node Power
Group % Availability
Event Log
413
Averaged Percent Availability
426
dBmV/Bandwidth
101
98
95
92
89
86
83
80
77
74
71
99 99 99
81
98 99
99 99 99
DemoNode11
DemoNode13
DemoNode15
Nodes
Reset...
Update Statistics
Help
350C
373

FIG. 11C

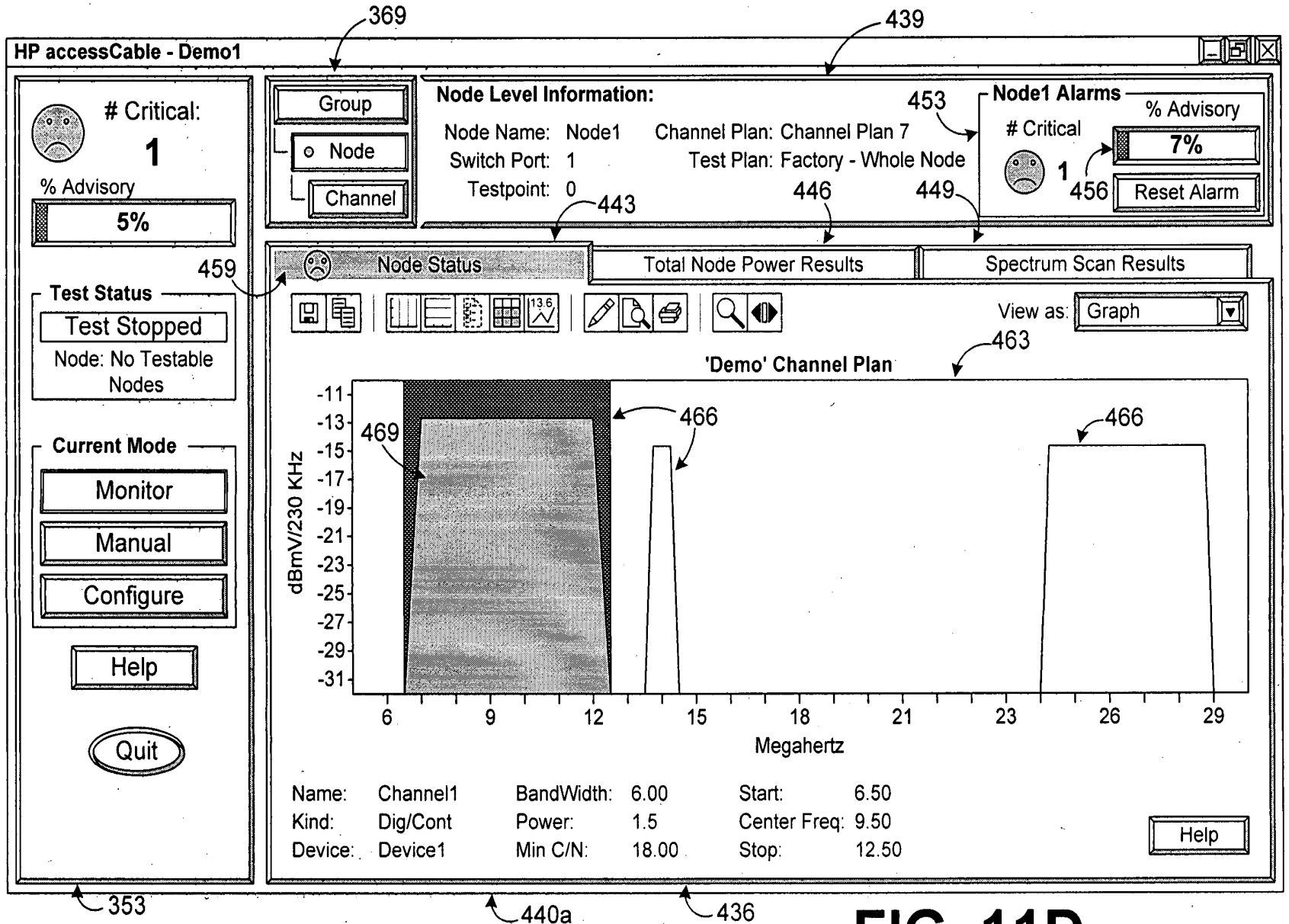

HP accessCable - Demo1
369
439
Critical:
1
% Advisory
5%
459
Test Status
Test Stopped
Node: No Testable Nodes
Current Mode
Monitor
Manual
Configure
Help
Quit
Group
Node
Channel
Node Level Information:
Node Name: Node1
Switch Port: 1
Testpoint: 0
Channel Plan: Channel Plan 7
Test Plan: Factory - Whole Node
453
Node1 Alarms
Critical
1
456
% Advisory
7%
Reset Alarm
443
446
449
Node Status
Total Node Power Results
Spectrum Scan Results
View as: Graph
463
'Demo' Channel Plan
dBmV/230 KHz
-11
-13
-15
-17
-19
-21
-23
-25
-27
-29
-31
469
466
466
6
9
12
15
18
21
23
26
29
Megahertz
Name: Channel1
Kind: Dig/Cont
Device: Device1
BandWidth: 6.00
Power: 1.5
Min C/N: 18.00
Start: 6.50
Center Freq: 9.50
Stop: 12.50
Help
353
440a
436

FIG. 11D

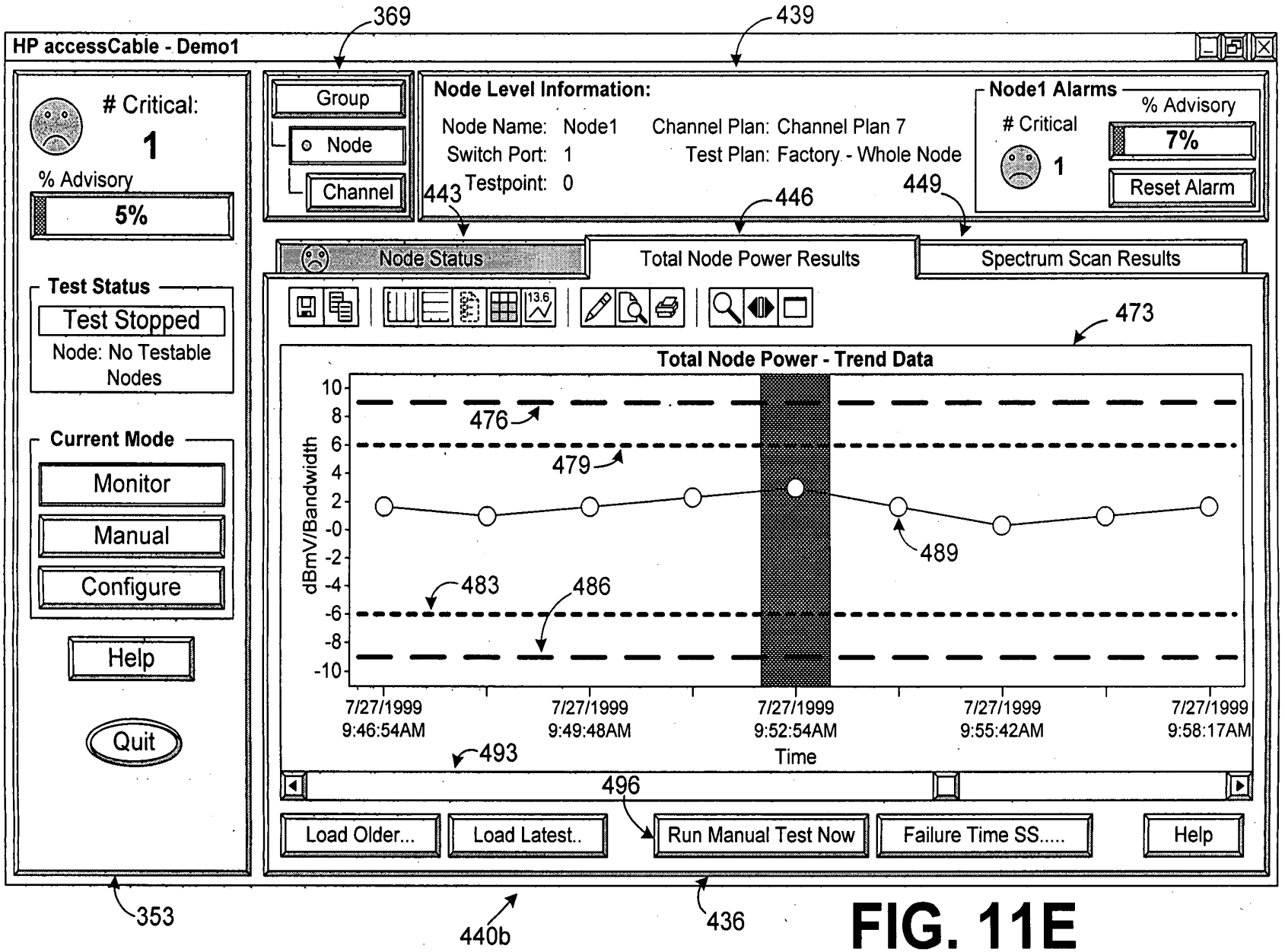

HP accessCable - Demo1
369
439
Critical:
1
% Advisory
5%
Test Status
Test Stopped
Node: No Testable Nodes
Current Mode
Monitor
Manual
Configure
Help
Quit
Group
Node
Channel
Node Level Information:
Node Name: Node1
Channel Plan: Channel Plan 7
Switch Port: 1
Test Plan: Factory - Whole Node
Testpoint: 0
Node1 Alarms
Critical
1
% Advisory
7%
Reset Alarm
443
446
449
Node Status
Total Node Power Results
Spectrum Scan Results
473
Total Node Power - Trend Data
dBmV/Bandwidth
10
8
6
4
2
-0
-2
-4
-6
-8
-10
476
479
489
483
486
7/27/1999 9:46:54AM
7/27/1999 9:49:48AM
7/27/1999 9:52:54AM
7/27/1999 9:55:42AM
7/27/1999 9:58:17AM
Time
493
496
Load Older...
Load Latest..
Run Manual Test Now
Failure Time SS.....
Help
353
440b
436

FIG. 11E

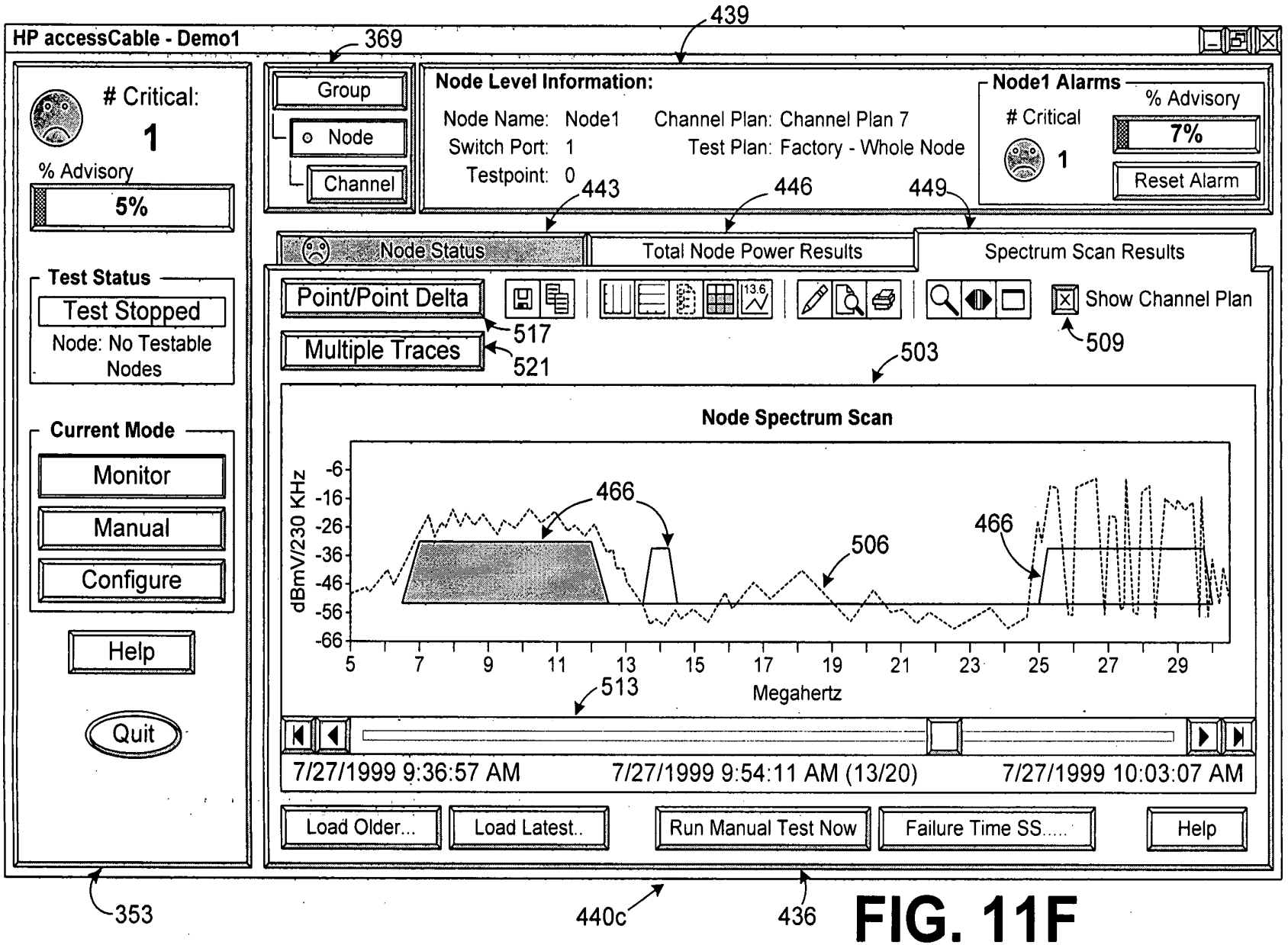

HP accessCable - Demo1
369
439
Critical:
1
% Advisory
5%
Test Status
Test Stopped
Node: No Testable Nodes
Current Mode
Monitor
Manual
Configure
Help
Quit
Group
Node
Channel
Node Level Information:
Node Name: Node1
Channel Plan: Channel Plan 7
Switch Port: 1
Test Plan: Factory - Whole Node
Testpoint: 0
Node1 Alarms
Critical
1
% Advisory
7%
Reset Alarm
443
446
449
Node Status
Total Node Power Results
Spectrum Scan Results
Point/Point Delta
517
Multiple Traces
521
Show Channel Plan
509
503
Node Spectrum Scan
dBmV/230 KHz
-6
-16
-26
-36
-46
-56
-66
466
506
466
5
7
9
11
13
15
17
19
21
23
25
27
29
Megahertz
513
7/27/1999 9:36:57 AM
7/27/1999 9:54:11 AM (13/20)
7/27/1999 10:03:07 AM
Load Older...
Load Latest..
Run Manual Test Now
Failure Time SS.....
Help
353
440c
436

FIG. 11F

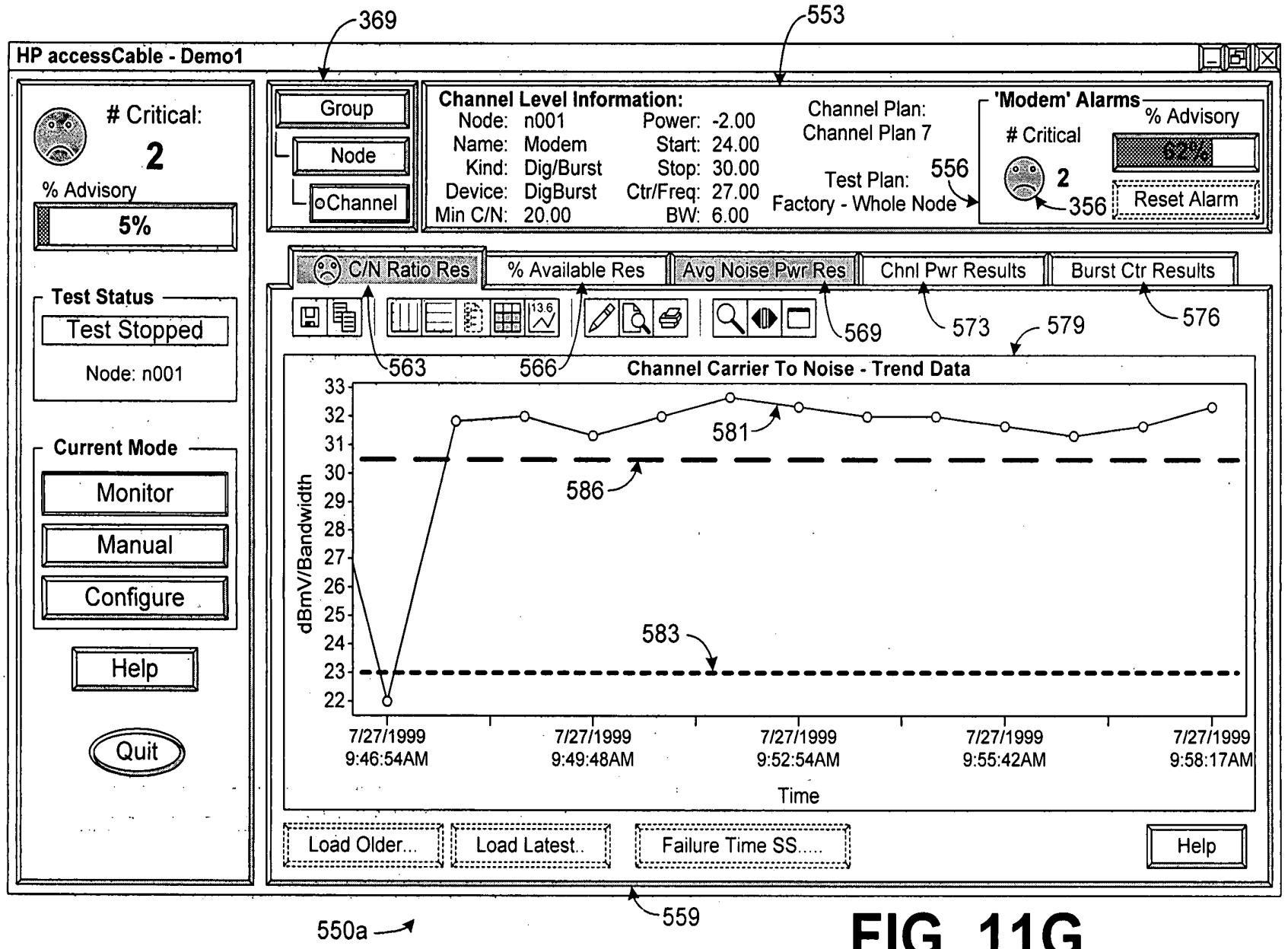

HP accessCable - Demo1
369
553
Critical:
2
% Advisory
5%
Test Status
Test Stopped
Node: n001
Current Mode
Monitor
Manual
Configure
Help
Quit
Group
Node
oChannel
Channel Level Information:
Node: n001
Name: Modem
Kind: Dig/Burst
Device: DigBurst
Min C/N: 20.00
Power: -2.00
Start: 24.00
Stop: 30.00
Ctr/Freq: 27.00
BW: 6.00
Channel Plan:
Channel Plan 7
Test Plan:
Factory - Whole Node
556
'Modem' Alarms
Critical
2
356
% Advisory
62%
Reset Alarm
C/N Ratio Res
% Available Res
Avg Noise Pwr Res
Chnl Pwr Results
Burst Ctr Results
563
566
569
573
579
576
Channel Carrier To Noise - Trend Data
dBmV/Bandwidth
33
32
31
30
29
28
27
26
25
24
23
22
581
586
583
7/27/1999 9:46:54AM
7/27/1999 9:49:48AM
7/27/1999 9:52:54AM
7/27/1999 9:55:42AM
7/27/1999 9:58:17AM
Time
Load Older...
Load Latest..
Failure Time SS.....
Help
559
550a

FIG. 11G

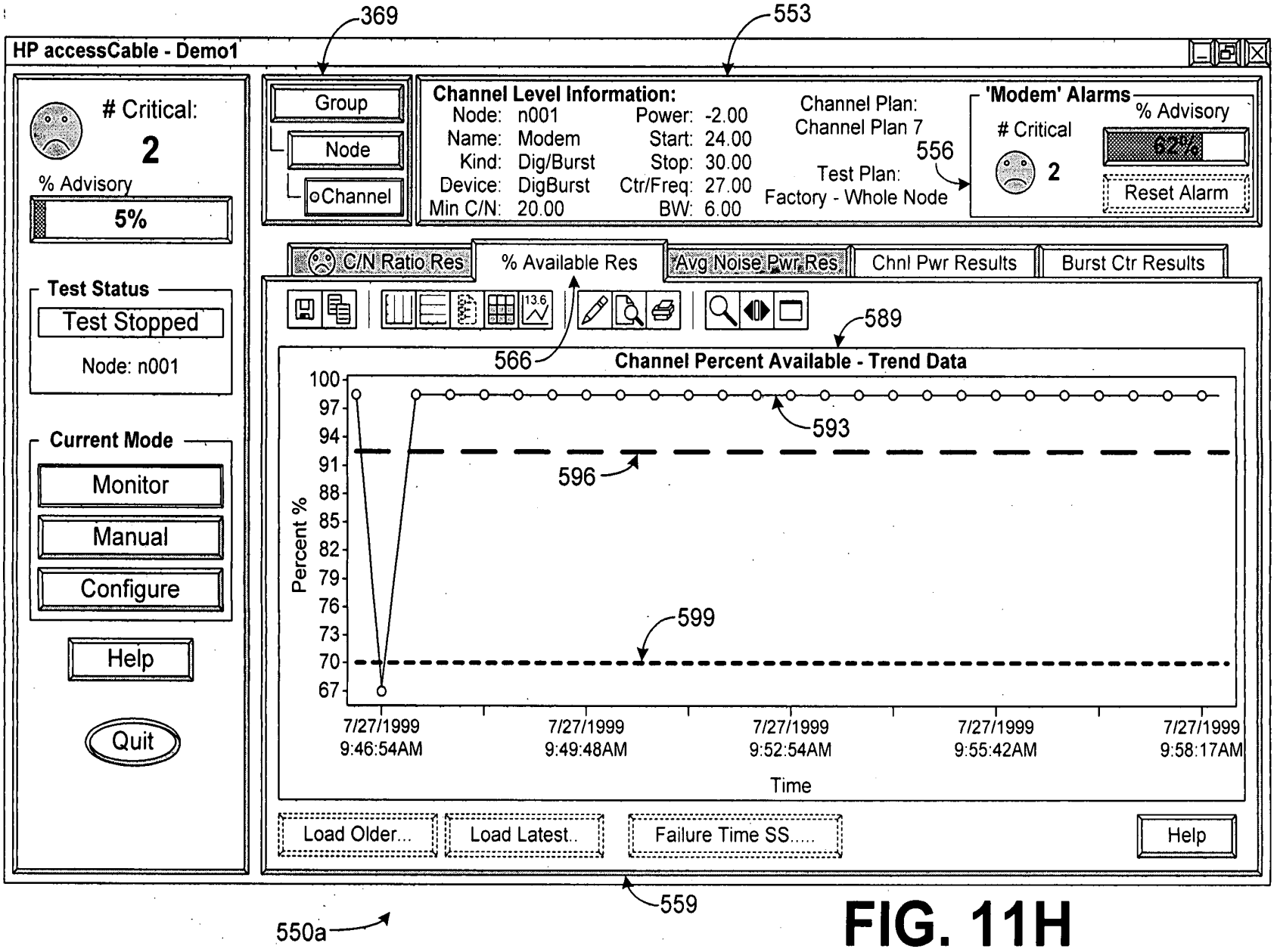

369
553
HP accessCable - Demo1
Critical:
2
% Advisory
5%
Test Status
Test Stopped
Node: n001
Current Mode
Monitor
Manual
Configure
Help
Quit
Group
Node
oChannel
Channel Level Information:
Node: n001
Name: Modem
Kind: Dig/Burst
Device: DigBurst
Min C/N: 20.00
Power: -2.00
Start: 24.00
Stop: 30.00
Ctr/Freq: 27.00
BW: 6.00
Channel Plan:
Channel Plan 7
Test Plan:
Factory - Whole Node
556
'Modem' Alarms
Critical
2
% Advisory
62%
Reset Alarm
C/N Ratio Res
% Available Res
Avg Noise Pwr Res
Chnl Pwr Results
Burst Ctr Results
566
589
Channel Percent Available - Trend Data
100
97
94
91
88
85
82
79
76
73
70
67
Percent %
593
596
599
7/27/1999 9:46:54AM
7/27/1999 9:49:48AM
7/27/1999 9:52:54AM
7/27/1999 9:55:42AM
7/27/1999 9:58:17AM
Time
Load Older...
Load Latest..
Failure Time SS.....
Help
559
550a

FIG. 11H

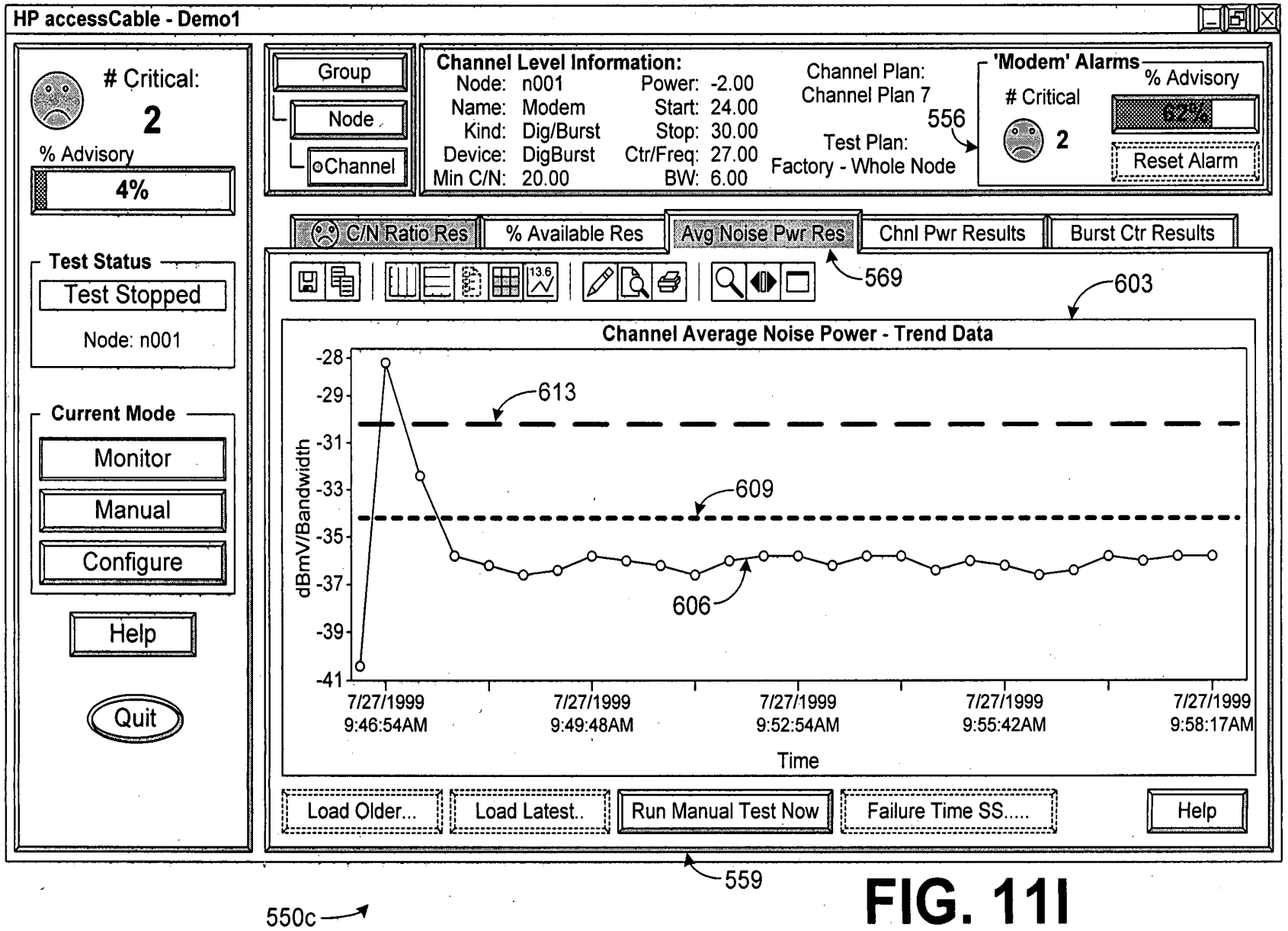

HP accessCable - Demo1
Critical:
2
% Advisory
4%
Test Status
Test Stopped
Node: n001
Current Mode
Monitor
Manual
Configure
Help
Quit
Group
Node
Channel
Channel Level Information:
Node: n001
Name: Modem
Kind: Dig/Burst
Device: DigBurst
Min C/N: 20.00
Power: -2.00
Start: 24.00
Stop: 30.00
Ctr/Freq: 27.00
BW: 6.00
Channel Plan:
Channel Plan 7
Test Plan:
Factory - Whole Node
556
'Modem' Alarms
Critical
2
% Advisory
62%
Reset Alarm
C/N Ratio Res
% Available Res
Avg Noise Pwr Res
Chnl Pwr Results
Burst Ctr Results
569
603
Channel Average Noise Power - Trend Data
dBmV/Bandwidth
-28
-29
-31
-33
-35
-37
-39
-41
613
609
606
7/27/1999 9:46:54AM
7/27/1999 9:49:48AM
7/27/1999 9:52:54AM
7/27/1999 9:55:42AM
7/27/1999 9:58:17AM
Time
Load Older...
Load Latest..
Run Manual Test Now
Failure Time SS.....
Help
559
550c

FIG. 11I

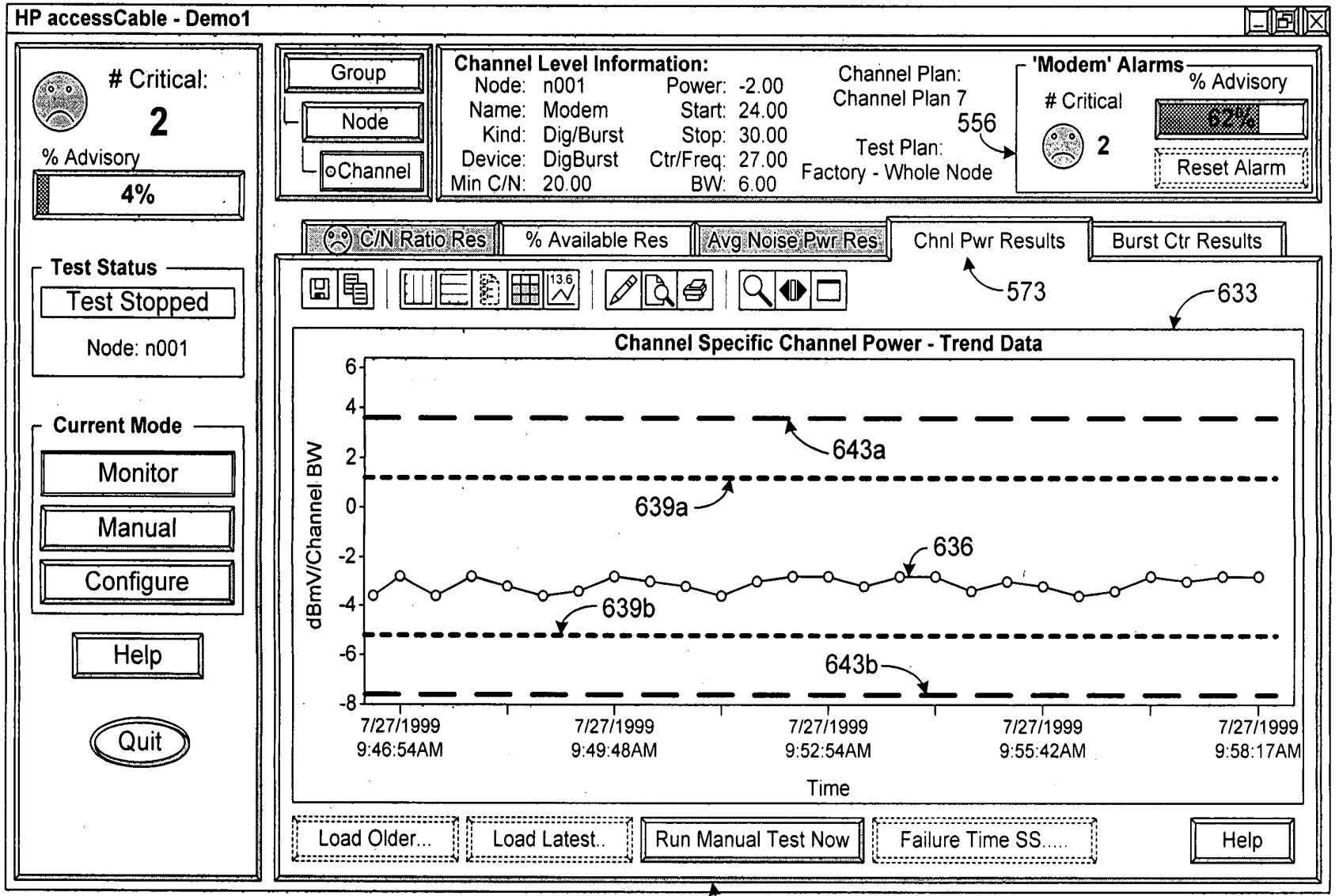

HP accessCable - Demo1
Critical:
2
% Advisory
4%
Test Status
Test Stopped
Node: n001
Current Mode
Monitor
Manual
Configure
Help
Quit
Group
Node
Channel
Channel Level Information:
Node: n001
Name: Modem
Kind: Dig/Burst
Device: DigBurst
Min C/N: 20.00
Power: -2.00
Start: 24.00
Stop: 30.00
Ctr/Freq: 27.00
BW: 6.00
Channel Plan:
Channel Plan 7
Test Plan:
Factory - Whole Node
556
'Modem' Alarms
Critical
2
% Advisory
62%
Reset Alarm
C/N Ratio Res
% Available Res
Avg Noise Pwr Res
Chnl Pwr Results
Burst Ctr Results
573
633
Channel Specific Channel Power - Trend Data
dBmV/Channel BW
6
4
2
0
-2
-4
-6
-8
643a
639a
636
639b
643b
7/27/1999 9:46:54AM
7/27/1999 9:49:48AM
7/27/1999 9:52:54AM
7/27/1999 9:55:42AM
7/27/1999 9:58:17AM
Time
Load Older...
Load Latest..
Run Manual Test Now
Failure Time SS.....
Help
559
550d

FIG. 11J

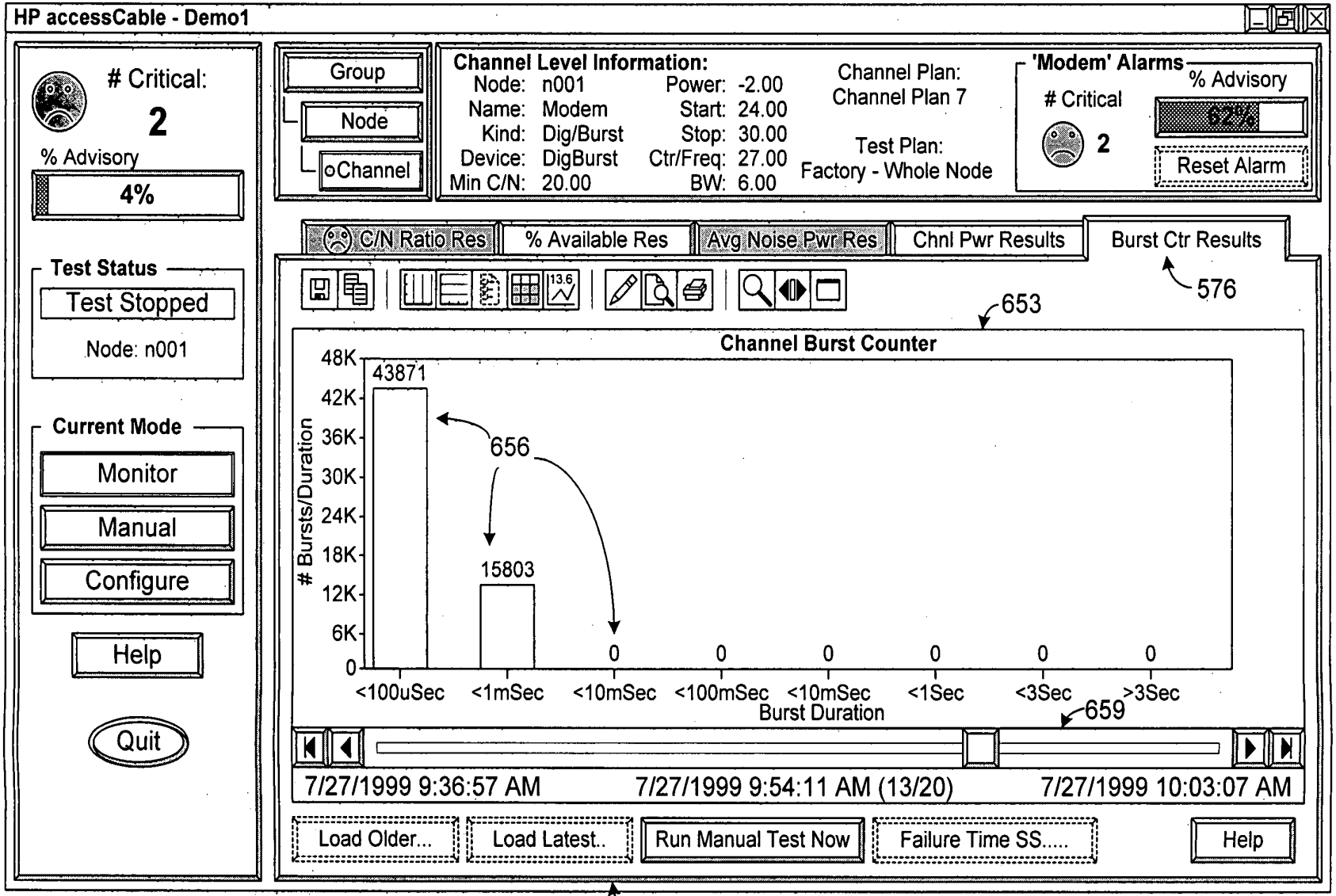

HP accessCable - Demo1
Critical:
2
% Advisory
4%
Test Status
Test Stopped
Node: n001
Current Mode
Monitor
Manual
Configure
Help
Quit
Group
Node
oChannel
Channel Level Information:
Node: n001
Name: Modem
Kind: Dig/Burst
Device: DigBurst
Min C/N: 20.00
Power: -2.00
Start: 24.00
Stop: 30.00
Ctr/Freq: 27.00
BW: 6.00
Channel Plan:
Channel Plan 7
Test Plan:
Factory - Whole Node
'Modem' Alarms
Critical
2
% Advisory
62%
Reset Alarm
C/N Ratio Res
% Available Res
Avg Noise Pwr Res
Chnl Pwr Results
Burst Ctr Results
576
653
Channel Burst Counter
Bursts/Duration
48K
42K
36K
30K
24K
18K
12K
6K
0
43871
15803
656
0
<100uSec
<1mSec
<10mSec
<100mSec
<10mSec
<1Sec
<3Sec
>3Sec
Burst Duration
659
7/27/1999 9:36:57 AM
7/27/1999 9:54:11 AM (13/20)
7/27/1999 10:03:07 AM
Load Older...
Load Latest..
Run Manual Test Now
Failure Time SS.....
Help
559
550e

FIG. 11K

TEST CONFIGURATION GUI NAVIGATION

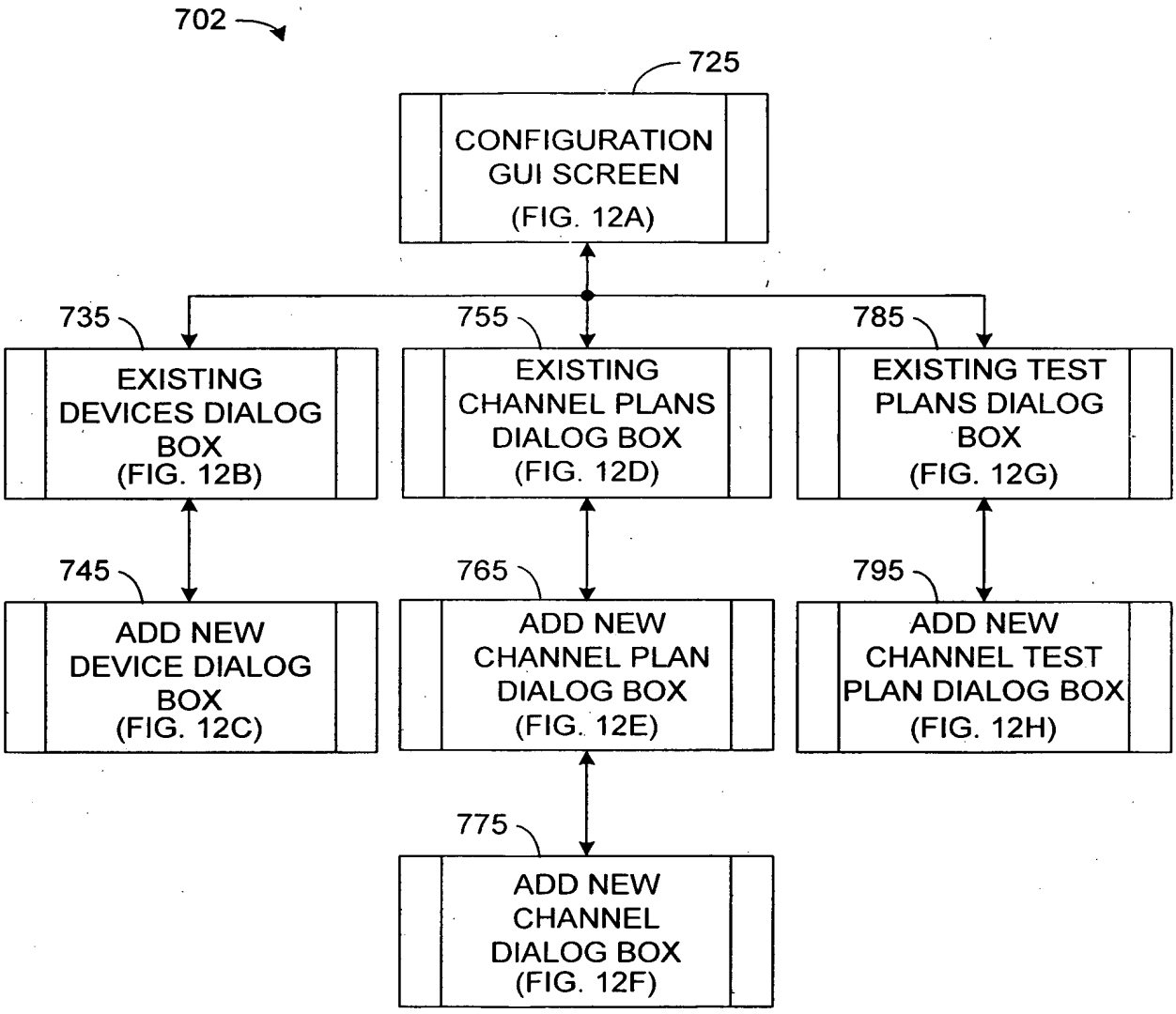


FIG. 12

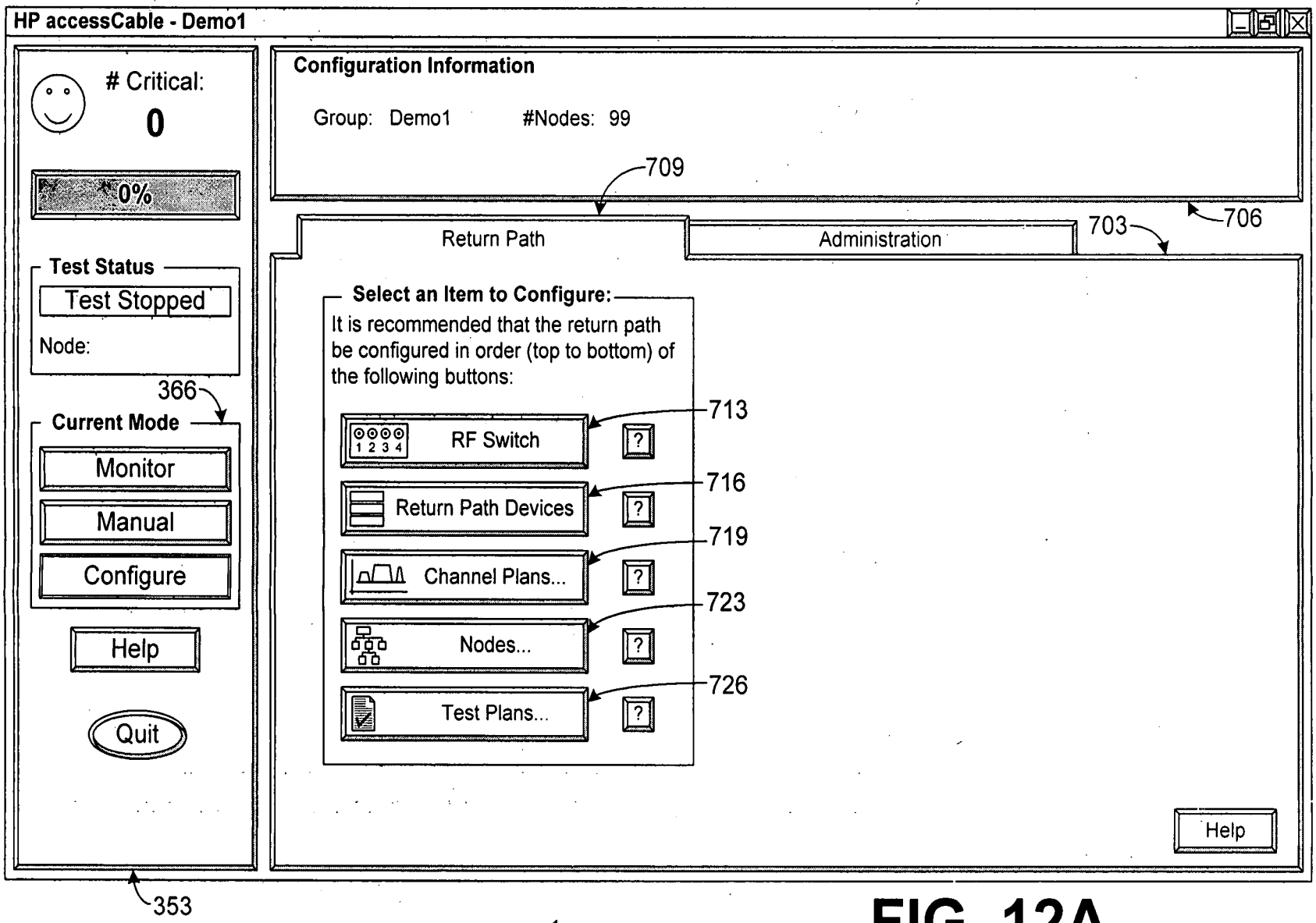

HP accessCable - Demo1
Critical:
0
0%
Test Status
Test Stopped
Node:
366
Current Mode
Monitor
Manual
Configure
Help
Quit
353
Configuration Information
Group: Demo1
#Nodes: 99
709
706
703
Return Path
Administration
Select an Item to Configure:
It is recommended that the return path be configured in order (top to bottom) of the following buttons:
RF Switch
Return Path Devices
Channel Plans...
Nodes...
Test Plans...
713
716
719
723
726
Help
700

FIG. 12A

6,601,077 B1

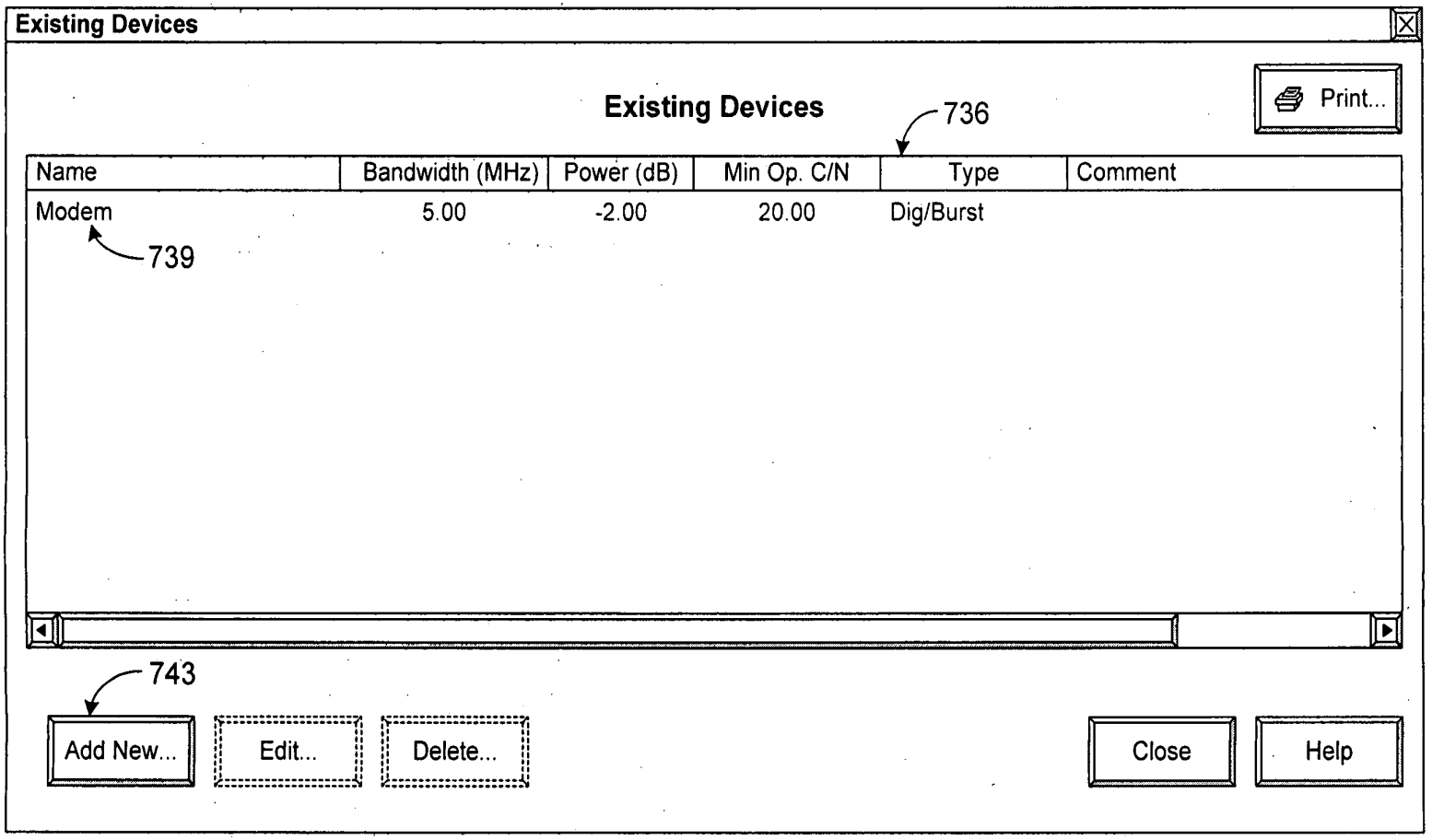


FIG. 12B

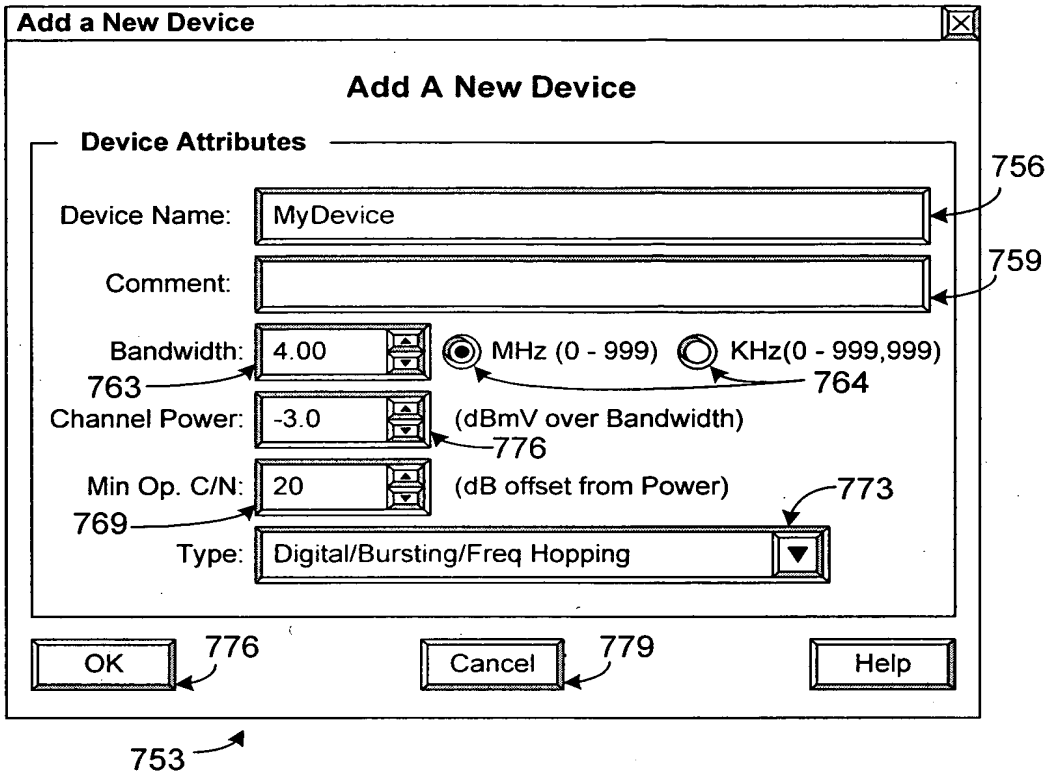

Add a New Device
Add A New Device
Device Attributes
Device Name:
MyDevice
Comment:
Bandwidth:
4.00
MHz (0 - 999)
KHz(0 - 999,999)
Channel Power:
-3.0
(dBmV over Bandwidth)
Min Op. C/N:
20
(dB offset from Power)
Type:
Digital/Bursting/Freq Hopping
OK
Cancel
Help
756
759
763
764
776
769
773
776
779
753

FIG. 12C

Select Language

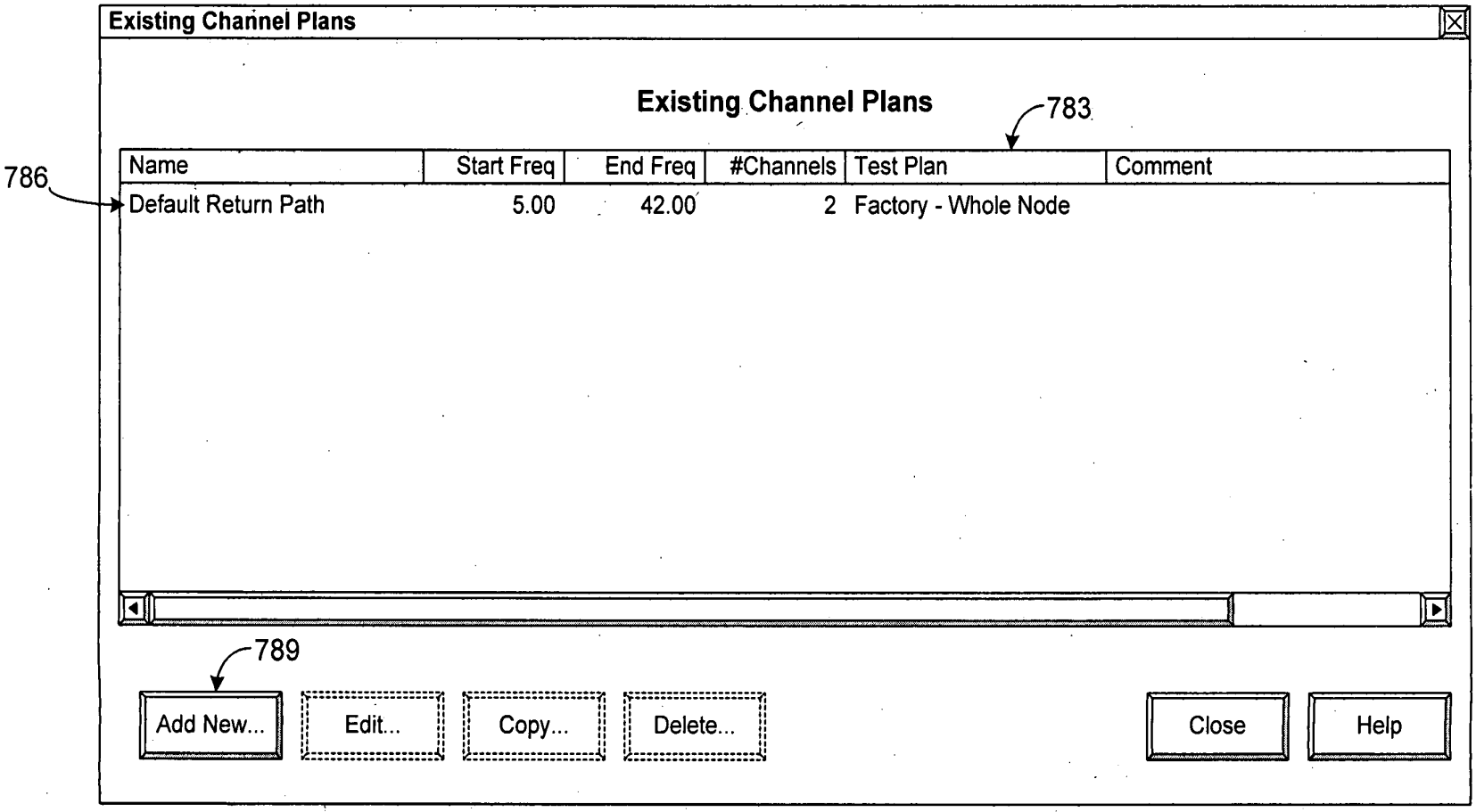


FIG. 12D

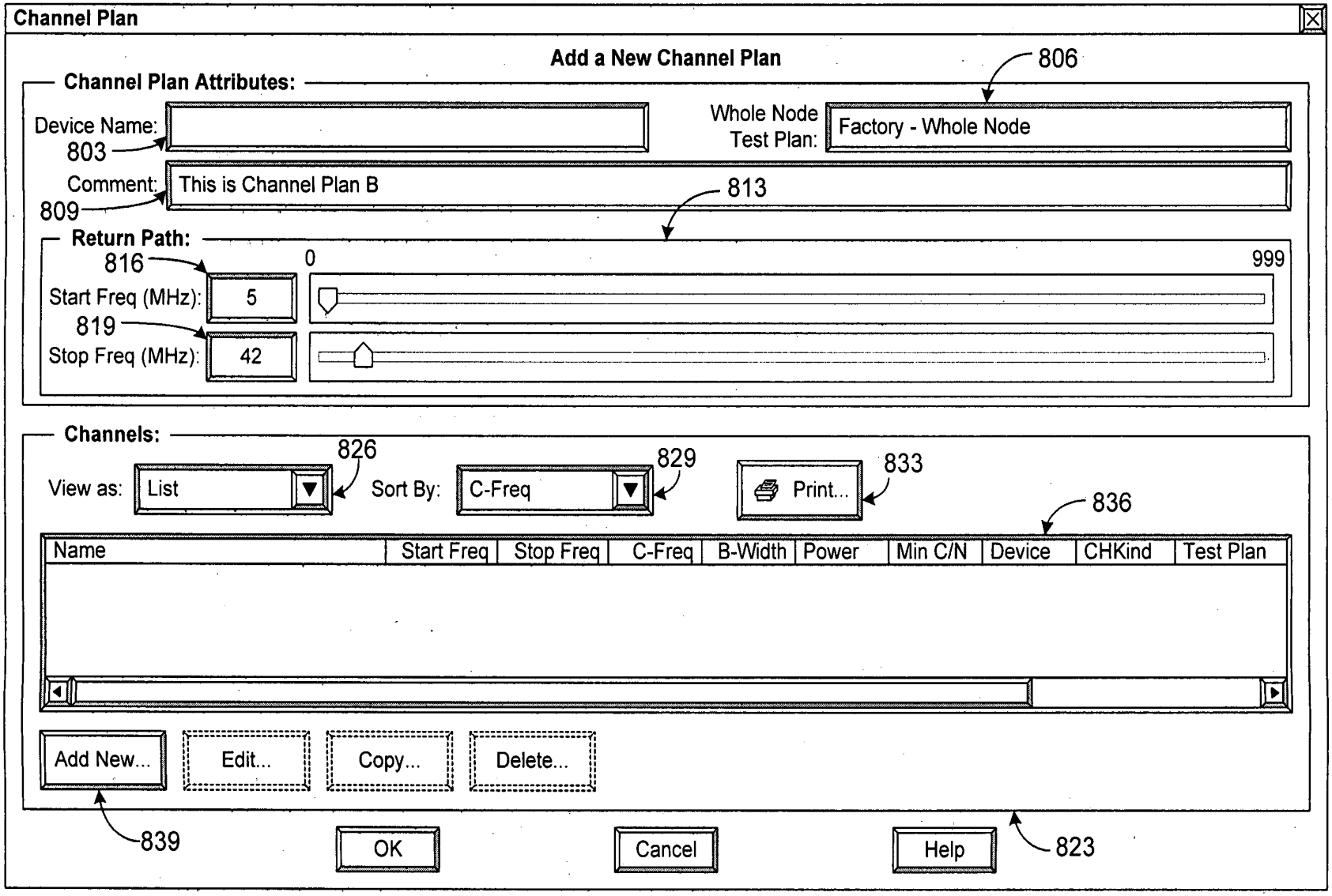

Channel Plan
Add a New Channel Plan
806
Channel Plan Attributes:
Device Name:
803
Whole Node Test Plan:
Factory - Whole Node
Comment:
809
This is Channel Plan B
813
Return Path:
816
0
999
Start Freq (MHz):
5
819
Stop Freq (MHz):
42
Channels:
826
View as:
List
Sort By:
829
C-Freq
Print...
833
836
Name
Start Freq
Stop Freq
C-Freq
B-Width
Power
Min C/N
Device
CHKind
Test Plan
Add New...
Edit...
Copy...
Delete...
839
OK
Cancel
Help
823
800

FIG. 12E

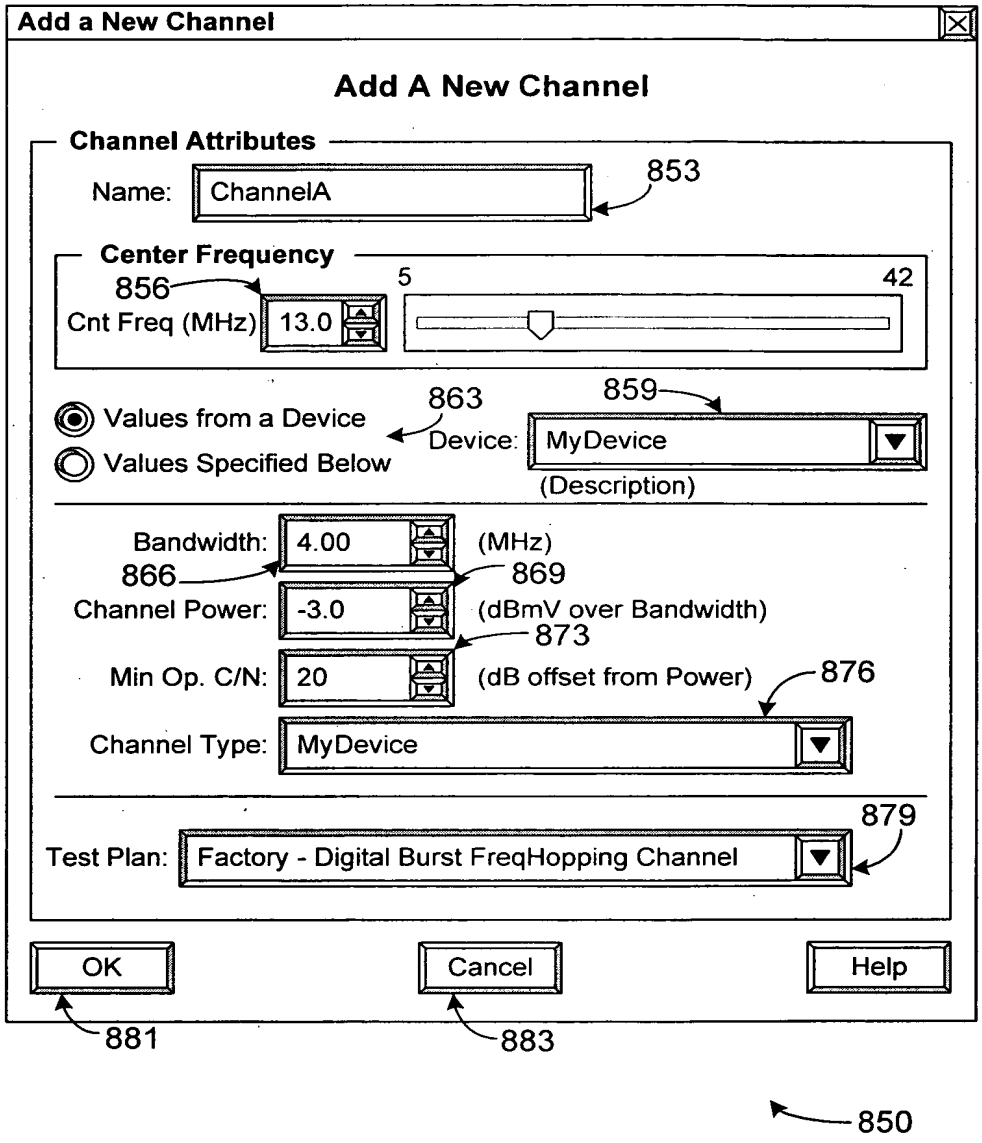

Add a New Channel
Add A New Channel
Channel Attributes
Name:
ChannelA
853
Center Frequency
856
Cnt Freq (MHz)
13.0
5
42
Values from a Device
Values Specified Below
863
Device:
859
MyDevice
(Description)
Bandwidth:
4.00
(MHz)
866
869
Channel Power:
-3.0
(dBmV over Bandwidth)
873
Min Op. C/N:
20
(dB offset from Power)
876
Channel Type:
MyDevice
879
Test Plan:
Factory - Digital Burst FreqHopping Channel
OK
Cancel
Help
881
883
850

FIG. 12F

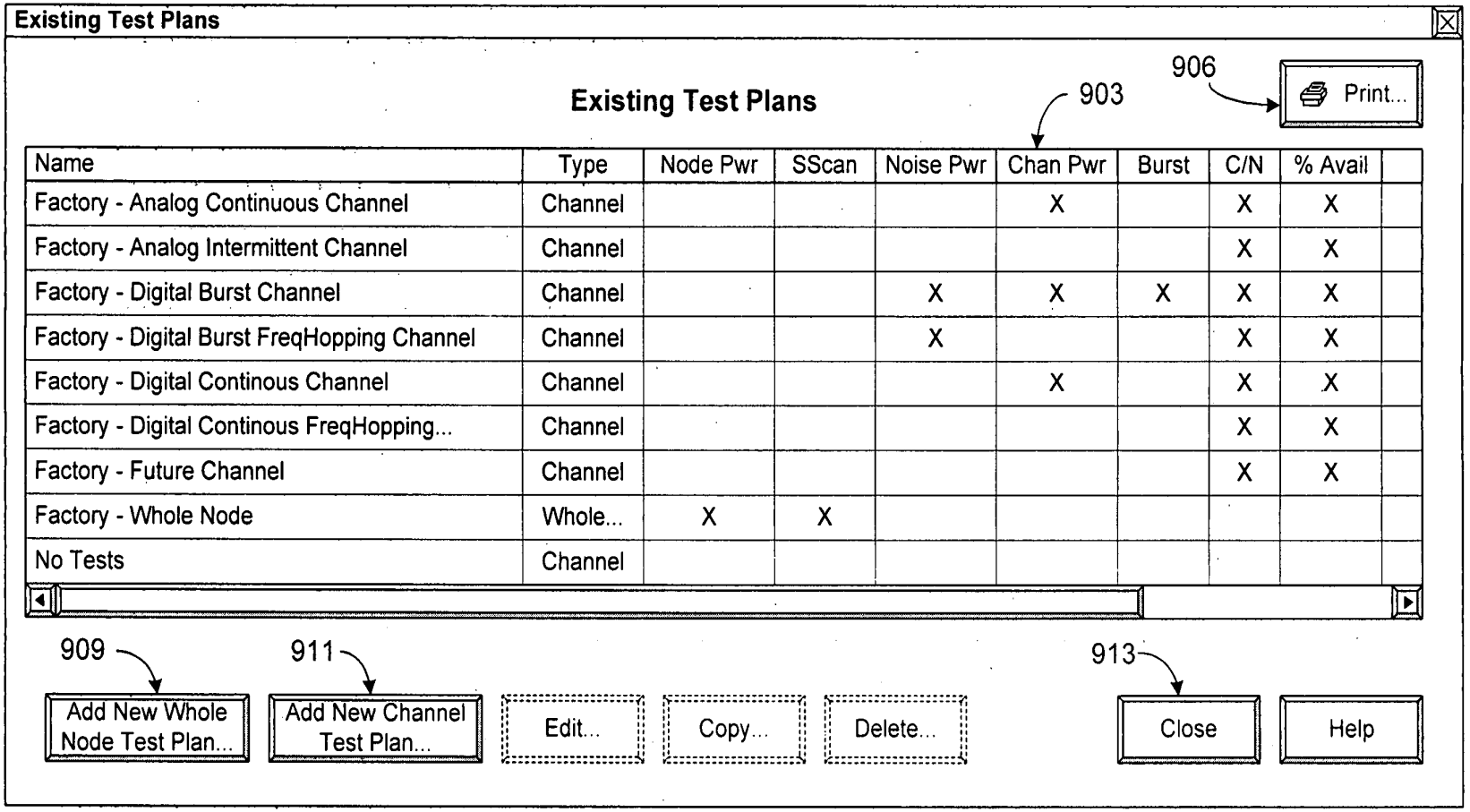

Existing Test Plans
Existing Test Plans
906
Print...
903
Name
Type
Node Pwr
SScan
Noise Pwr
Chan Pwr
Burst
C/N
% Avail
Factory - Analog Continuous Channel
Channel
X
X
X
Factory - Analog Intermittent Channel
Channel
X
X
Factory - Digital Burst Channel
Channel
X
X
X
X
X
Factory - Digital Burst FreqHopping Channel
Channel
X
X
X
Factory - Digital Continous Channel
Channel
X
X
X
Factory - Digital Continous FreqHopping...
Channel
X
X
Factory - Future Channel
Channel
X
X
Factory - Whole Node
Whole...
X
X
No Tests
Channel
909
911
913
Add New Whole Node Test Plan...
Add New Channel Test Plan...
Edit...
Copy...
Delete...
Close
Help
900

FIG. 12G

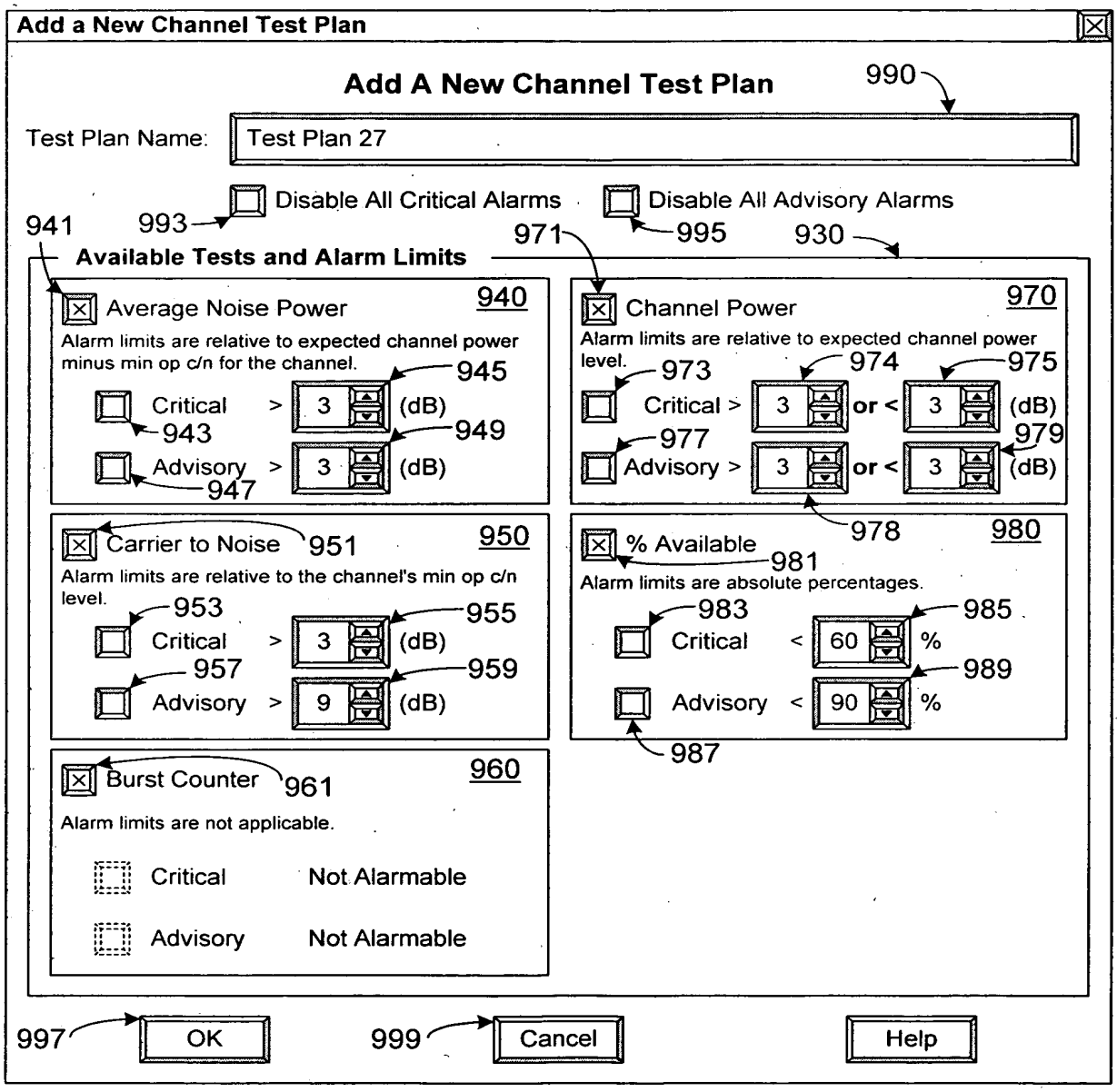

Add a New Channel Test Plan
Add A New Channel Test Plan
990
Test Plan Name:
Test Plan 27
Disable All Critical Alarms
Disable All Advisory Alarms
941
993
971
995
930
Available Tests and Alarm Limits
Average Noise Power
940
Alarm limits are relative to expected channel power minus min op c/n for the channel.
945
Critical > 3 (dB)
943
949
Advisory > 3 (dB)
947
Channel Power
970
Alarm limits are relative to expected channel power level.
973
974
975
Critical > 3 or < 3 (dB)
977
979
Advisory > 3 or < 3 (dB)
978
Carrier to Noise
951
950
Alarm limits are relative to the channel's min op c/n level.
953
955
Critical > 3 (dB)
957
959
Advisory > 9 (dB)
% Available
981
980
Alarm limits are absolute percentages.
983
985
Critical < 60 %
989
Advisory < 90 %
987
Burst Counter
961
960
Alarm limits are not applicable.
Critical Not Alarmable
Advisory Not Alarmable
997
OK
999
Cancel
Help
925

FIG. 12H